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# THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

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# The American Journal of Obstetrics and Gynecology

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## Original Communications

### THE DEVELOPMENT OF THE HYMEN*

BY FRED J. TAUSSIG, M.D., F.A.C.S., ST. LOUIS, MO.

IN 1908 in an article published in the *American Journal of Anatomy* I presented evidence based on the serial study of six embryos of 12-26 cm. body length that pointed to the origin of the hymen as a connective tissue proliferation directly back of the entrance of the vagina into the urogenital sinus. I stated at the time that I did not consider these six embryos sufficient to establish my views and that I hoped in the course of years to find some authoritative confirmation or refutation of my findings. Strange to relate, while a number of articles dealing with this subject have appeared during the past thirteen years, the evidence has as before been largely based on the study of congenital anomalies, of gross anatomic dissections and of single microscopic sections through the lower portion of the genital tract. Textbooks of embryology have in the main simply restated the time-worn theory of Nagel that the hymen was an obliteration membrane left at the point of entrance of the muellerian ducts into the urogenital sinus. The latest textbook by Prentiss-Arey (1920) again says: "The muellerian tubercle is compressed into a disk, lined internally by the vaginal epithelium, externally by the epithelium of the urogenital sinus or future vestibule. These layers with the mesenchyme between them constitute the hymen, which thus guards the opening into the vagina."

I have therefore felt impelled once more to take up the cudgels in

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NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

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defense of my theory and try if possible definitely to settle all points concerned. All students of embryology must acknowledge that in dealing with such a minute fold as the hymen during its early stages, serial microscopic sections can alone be relied on to give the necessary information. Access to an unusually large collection of well-preserved embryos from the fourth to the sixth month of fetal life in the Anatomical Department of Washington University gave me opportunity to supplement on a larger scale my original studies. Twenty embryos varying from 15.5 to 33.5 cm. head-breech measurement were examined* and the lower urogenital tract studied in sagittal serial sections. In almost every point these investigations confirmed my former findings and their interpretation.

*The Hymen in Animals.*—According to Schmaltz, in pigs, horses, cattle and dogs there is a definite constriction at the junction of the vagina with the vestibule. At times this constriction has the appearance of a membrane, but the descriptions do not indicate any active connective tissue proliferation at this point, no formation of vaginal rugae or intertwining folds such as appear in certain anthropoid apes and in the human race. A similar constriction is found at the anus, the urethra or almost at any point where one duct joins another or reaches the surface. It is, however, a very different thing from the typical fold we see in certain apes and in man. Such a fold is not present in lower animals. Particularly in the American apes (Cebus) and in certain anthropoid apes such as the chimpanzee and gorilla a distinct hymeneal fold has been regularly found. The resemblance of the hymen and the genital organs in the American ape and the human race suggests that secondary retrogressions within the primary family tree may have occurred and that in this respect man may retain a more primitive form than that found in some of the anthropoid apes.

In the embryo of 3 cm. body length the muellerian ducts reach the urogenital sinus and, after coalescing, project into the lumen of the sinus as an epithelial proliferation called the muellerian eminence. Six weeks later in the 10-12 cm. embryo there occurs a bulb-like enlargement of the coalesced ducts directly back of this eminence. This brings about a fold or membrane formation that Nagel interprets as the original hymen. Berry Hart on the basis of five embryos studied in serial section considers this bulb-like thickening as a product of the wolffian duct and hence concludes the hymen to be of wolffian origin. The careful investigations of Robert Meyer in 116 embryos studied serially definitely proves, at least to my mind, the falseness of Berry Hart's views. He found evidence of the wolffian duct as a separate, narrow duct in a large proportion of his embryos reaching all the way

*A detailed report of the gross and microscopic findings in these embryos is reserved for later publication.

down even to the edge of the hymen. The wolffian duct cannot, therefore, form the lower vagina as Berry Hart would have us believe.

The mistake that Nagel and so many of the men who have studied the subject since his time have made has been that they failed to study what becomes of this original connective tissue fold in the course of the following six weeks. In 1875 Dohrn, who paid special attention to this stage of embryonic development, found in a study of 25 embryos of 18-26 cm. body length on cross-section with the aid only of a magnifying glass that the true hymeneal fold occurred as an independent proliferation directly behind this original occluding membrane. Let us also remember the evidence of Schaeffer who made similar cross-section studies in 170 embryos and found in many in-

Fig. 1.—Sagittal section, slightly lateral to midline, showing hymen (Hy) as a fold within the vagina (Va) and separate from the entrance into the urogenital sinus (U. S.).

stances a double fold which in my previous paper I interpreted as due to occasional persistence of the original muellerian eminence fold in addition to the true hymen.

What I mean by these two folds can best be seen by going on to a study of my own evidence. In the smallest embryo of my series (Fig. 1) one of 15.5 cm. head-breech measurement, you see the eminential fold similar to that described by Nagel, but above it lies another definite connective tissue fold or membrane that can be followed as such in my serial sections. This fold measures in its anteroposterior diameter one half millimeter. The next step is the dilation of what I have termed the "eminential fold" (the original hymen of Nagel) by an outgrowth of epithelium and connective tissue from the vagina (Fig. 2). All embryologists have been astounded at the pronounced growth impulse

that is localized at this point during this period. In the short space of six weeks the hymen increases over 20-fold in size, for in the embryo of 30 cm. body length it is 10 mm. in anteroposterior diameter and protrudes for a distance of 6 mm. out into the vestibulum. Measured along its circumference the hymen would be almost 15 mm. in greatest extent. Now let us watch step by step the manner in which this tremendous outgrowth occurs. Limited anteriorly and posteriorly by the urethra and rectum it is but natural that this growth energy should have sought the point of least resistance, namely outward through the original vaginal orifice between the labial folds and beyond. I wish to call especial attention to the following points:

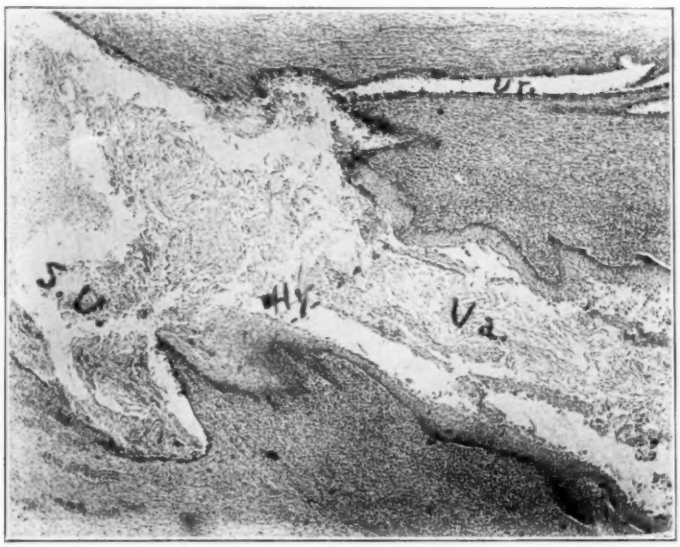


Fig. 2.—Sagittal mesial section embryo (16 cm. head-breech) showing edge of hymeneal ring inside the vagina. The muellerian eminential fold lies between it and the urogenital sinus (S. U.).

(1) In the earlier stages there is still a definite ring of the original eminential fold left at the margins of the hymen.

(2) The outgrowth is an actively proliferating process sending papillae in all directions, not a passively formed membrane due to epithelial enlargement at the end of the vagina as Nagel and other embryologists have stated.

(3) The outgrowing hymeneal fold is lined on both sides by typical vaginal epithelium (Fig. 3). Only in that portion of the hymen that juts far out beyond the labia do we note a beginning change resembling vulvar epithelium. In the hymen of the newborn this change to an epithelium resembling vulvar epithelium has become more pronounced over the entire outside of the hymen. It is because many have examined only the early stages of Nagel and the fully developed hymen of the new-

born that the original theories concerning its origin have so long held their ground. (Figs. 4-7.)

So much for my embryological evidence. What I have said against the value of anomalies of development in solving the hymen problem applies only to their value in *establishing* a theory. In the last analysis all studies of development must be based primarily on embryologic evidence but anomalies may well be used as evidence *in rebuttal* against any theory. Let us for a minute see how our theory will hold against such evidence *in rebuttal*. Pozzi, Küstner, Blair Bell and others have noted the following anomalies:

(1) Hymen present in complete atresia of vagina and uterus.

(2) Hymeneal fold around the urethra or vestibulum.

Fig. 3.—Sagittal mesial section, embryo (20.5 cm. head-breech) showing outgrowth of vaginal tissue forming the hymen through the muellerian eminential fold. The edge of this fold can still be recognized by its covering of vulvar epithelium at the lower half of the hymen. The hymen proper is covered on both sides by vaginal epithelium.

(3) Absence of hymen in presence of normal vagina and uterus.

(4) Single hymen with double vagina.

In the last mentioned instance an incomplete vaginal septum may explain the apparent singleness of the fold, particularly as we find double hymen with double vagina much oftener.

The other three anomalies, however, can hardly be explained if we accept the hymen as an essential part of the early developmental processes at the muellerian eminence. If, however, we accept my view that the hymen is a more or less independent mesodermal proliferation occurring at a later stage in the development of the vagina, then it would naturally follow that this mesodermal impulse might at times be misdirected and show itself as a urethral or vulvar fold outside its

normal position behind the muellerian eminence. Such a fold formation would to a certain degree be independent of the development of the vaginal tract, so that even in complete atresia of the vagina, a

Fig. 4.—External genitals of embryo, 15.5 cm. body length (same as Fig. 1). Labia majora separated, clitoris and labia minora visible but no external evidence of hymen.

Fig. 5.—External genitals of embryo 28 cm. body length, with prow-like projection of hymen (white) between labia.

Fig. 6.—External genitals of embryo 24 cm. body length with labia minora separated showing a typical septate hymen.

Fig. 7.—External genitals of embryo 23 cm. body length, showing typical fimbriate hymen.

fairly well defined hymen might be present and, on the other hand, in an arrest of development of the fold, we might have a normally formed genital tract with an absence of the hymen.

Even more interesting is the application of this view of the devel-

opment of the hymen to the interpretation of so-called hymeneal atresia. It has long been a puzzle how one little portion of the genital tract could become atresic and the remainder be fully developed and functionating. I refer now to the cases with normal onset of menstruation and the formation of a hematocolpos behind the occluding membrane. Nagel, Veit and others who held fast to the formation of the hymeneal membrane out of the muellerian eminential fold were convinced that such a localized vaginal atresia was embryologically unthinkable and sought to explain this phenomenon by some change in postfetal life. Infectious processes in the vagina of the newborn, more especially gonorrheal vaginitis, was thought to be the agent in formation of this obliterating membrane. This has seemed far-fetched to many. Why we should have agglutination of vaginal folds only at the vaginal orifice and not further inward as well, if it were due to a gonorrheal infection, is hard to understand. Furthermore well-defined hymeneal atresia with normal genital tract has been observed *at birth*. The most direct explanation of hymeneal atresia is to consider such a hymen not as *imperforate* but as *occluded*. Kermauner thus explains its formation: "Finally the closed hymeneal membrane is nothing more or less than an expression of excessive growth in the mesoderm. We can explain the origin of such deformities as an excessive growth, a sort of local giant-growth on a small scale." Blair Bell noticed particularly that the hymen in these cases "appeared to be irregularly attached to the surface of the obstructing membrane forming strands up to the periphery where it was tougher." His observations of such atresias and anomalous positions of the hymen outside of the vagina led him to support Pozzi's theory of the hymen as of vulvar origin. I agree with him that such observations point to the hymen as an active outgrowth of mesodermal tissue but I trust that the evidence I have presented tonight will convince him that *normally* the point where this outgrowth occurs is not in the vulva but in the vagina directly back of the eminential fold.

And now, most interesting of all, what is the purpose of this strange little structure, found only in certain apes and in the human race. Back of it must lie some story in our evolution that is well worth knowing more about. Its early pronounced fetal development points to its ontologic importance. Friedenthal has suggested that the purpose of the hymen may have been to protect the vagina from urine. To this I would object; (1) that urine is not irritating to the vagina unless it is retained there in a pocket; and (2) that only in an animal with the urethra above the vagina would there be such contamination. In the standing posture there is no appreciable greater contamination of the vagina with urine than in animals on all fours.

Klaatsch's theory is that in some way the hymen must have had to

do with the manner of sexual intercourse of our progenitors. It may be true that such a hymeneal fold is less of an obstruction when relations are had from behind than in the normal human way but even so it is an obstruction rather than a guide as Klaatsch would have us believe. Certainly the many other lower animals who practice coitus from behind have not needed such a membrane. I do not see anything to justify such a theory.

To me the answer to this problem must be sought somewhere in the changes occurring in the transformation of the four-legged into the two-legged animal. Going hand in hand with these changes to the erect posture are those in the internal genital tract by which through the shortening of the vestibulum the vagina comes nearer to the surface. It is worthy of note that those American apes whose vagina is nearest to the outside have the best developed hymen. Now it is reasonably certain that our progenitors squatted on the ground far more than we. It must have taken a considerable period of time for the hind legs to have developed sufficiently to hold the body weight without tiring. We still see racial tendencies to such a squatting habit among the Arabs and other tribes. The young baby goes through such a period of squatting. If we now picture a vagina that lies nearer the surface than in lower animals the squatting posture must have given rise to contamination with insects and irritating substances from the ground unless Nature had taken some means to offer protection. The usual conception of the labial folds is that they have such a protecting function and it does not seem unreasonable to suppose that the hymen similarly and in a more direct manner served to keep out foreign material from the vagina. Particularly during the first years of life before the labia and their hairy covering are fully developed would such a hymeneal fold serve a definite purpose. According to this view, then, the hymen dates back to the time when the progenitors of the human race squatted on the ground.

4056 Maryland Avenue.

(*For discussion, see p. 525.*)

# HEMORRHAGE FROM THE NONPREGNANT UTERUS IN THE ABSENCE OF A NEOPLASM*

By W. A. Scott, B.A., M.B., F.A.C.S., Toronto, Ont.

A GREAT variety of terms have been used to describe the clinical phenomena of hemorrhage occurring from a nonpregnant uterus which is not the seat of a neoplasm. Climacteric hemorrhage and myopathic hemorrhage are two terms used from the clinical standpoint, whereas fibrosis uteri, chronic metritis, and arteriosclerosis of the uterus, are pathologic terms applied by other writers in the attempt to describe the clinical symptoms by a term descriptive of what they regard as the underlying pathologic condition.

The commonest of these terms in use today is fibrosis uteri, but it is one to which a great diversity of meaning is applied. Fletcher Shaw uses the term synonymously with chronic metritis and defines it as "a uterus symmetrically enlarged and hard, which contains no new growth and which produces hemorrhage, pain on leucorrhea, or any combination of these." Such a definition is a clinical, rather than a pathologic one. Furthermore, in all cases of idiopathic bleeding we do not find an enlarged or a hard uterus, some of them being small, atrophied, and of the senile type, others large and soft, large and hard, or normal in size.

The first scientific article on this subject was published by Scanzoni in 1860 and it was followed by another in 1863 in which he described two stages in the development of chronic metritis. The first stage he termed one of infiltration, with a large, soft uterus, due to hyperemia and edema and followed by a stage of induration, where the uterus was dry, hard, and anemic with vessels much reduced in caliber.

Seifert in 1866 and Saxinger in 1867 came to the conclusion that the bleeding was the result of subinvolution, while Finn asserted that the chief pathologic change was a hypertrophy of the muscle and the increase in fibrous tissue was negligible. Since that time there has been much debate whether the increase in size of these uteri was due to muscle alone, to muscle and connective tissue, or to connective tissue alone.

In 1870, curettage, as a treatment for hemorrhage, came into vogue and Olhausen placed the chief blame for the bleeding on the endometrium and septic endometritis came to be looked upon as the only

*Read by invitation before the Forty-sixth Annual Meeting of the American Gynecological Society, June 2-4, 1921.

cause for metritis. This idea inevitably led to the idea of chronic endometritis which persisted until the work of Hitschman and Adler in 1908 disproved the occurrence of chronic endometritis except in very rare instances.

Fritsch, Cornil, Pozzi and Reinicke all published articles between 1885 and 1897 without making any great contribution but in 1902 Theilhaber and Meier elaborated the theory of "muscular insufficiency" and at the same time contended that any change in the endometrium was secondary to that of the myometrium.

Barbour came to the conclusion that the main pathologic change was one of arteriosclerosis, although he pointed out that such a condition after the menopause is seldom, if ever, accompanied by serious hemorrhage. Hermann, Martin, and Rustner all agreed with this view, but Palmer Findlay, in 1905, disagreed and went back to the idea of muscular insufficiency. He held that the common cause of this muscular insufficiency is the increase of connective tissue at the expense of muscle, a fibrosis uteri, and that the most important precursor of this change is passive congestion of the uterus from any cause. He also taught that a hyperplasia of the endometrium was secondary to a primary metritis. Addinsell in 1906 contended that there were three stages in the process: infiltration of both endometrium and musculature, then an intermuscular fibrosis, and finally a degeneration of this fibrous overgrowth. In the same year Gardiner and Goodall published a comprehensive report in which they stated that any prolonged congestion causes hypertrophy or hyperplasia of muscular as well as connective tissue and if this is sufficiently prolonged the muscle fibers atrophy and the connective tissue predominates.

Archibald Donald in 1907 opposed the idea that the changes were due to passive congestion and pointed out that the vascular changes are inconstant. He believed that the changes in the endometrium are constant and that hypertrophy of this mucous membrane causes a work hypertrophy of the musculature. In 1910 Goodall published another paper on "Climacteric Hemorrhage" in which he pointed out that the areas of so-called hyaline degeneration around the blood vessels, described by previous writers, if stained by Weigert's method, would prove to be elastic tissue and he believed that the causative factor was subinvolution of the uterus. He did not believe that infection alone, apart from pregnancy, could give rise to chronic metritis. In the same year Rabinovitz stated that the blood vessel changes are secondary to those of the muscularis, as proved by invasion of fibrous tissue in the adventitia. He believed that the cause of the condition is the fact that connective tissue does not undergo retrograde changes as fast as the muscular tissue after pregnancy.

Briggs and Hendry studied 104 uteri removed for uncontrollable

hemorrhage cases and in their opinion the muscular changes can be either the result of subinvolution or of hypertrophy. They could not demonstrate any constant increase in the amount of elastic tissue and found great variations in size, number, and distribution of the vessels. Their view was that uncontrollable uterine hemorrhage is a functional disturbance.

Fletcher Shaw has possibly written more on the subject of chronic metritis than any one else. He published papers in 1907 and 1914 on its pathology and his views were summed up in his excellent article in *The New System of Gynecology* edited by Eden and Lockyear and published in 1917. He found no constant blood vessel changes and concluded that the hemorrhage is not dependent upon such changes, but he also pointed out that the increase in the size and thickness of the uterine wall is a constant feature and is due to an increase of both muscle and connective tissue. The endometrium was found to be fairly constantly thickened. Shaw confined his study to uteri symmetrically enlarged and hard, most of which were the site of hemorrhage, but in a few of which the symptoms were leucorrhea or pain. He studied, therefore, a definite uterine change rather than the broader question of idiopathic hemorrhage, for we know that the latter may occur from uteri that are not enlarged and are not hard. He divides the cases studied into three groups: (1) Chronic metritis, meaning the late result of inflammation and comprising 1 per cent of the total. (2) A subinvolution group, comprising 95 per cent of the total and (3) a hypertrophy group, comprising 4 per cent of the total. In both the subinvolution and hypertrophy types the endometrium was thickened and the glands dilated and he describes the hypertrophy cases as due to the efforts of the uterus to expel this thickened mucosa.

E. H. Macdonald considered that essential uterine hemorrhage is an abnormality of menstruation and conceives of the latter as being due to an inhibition and then a contraction of the uterine musculature.

Novak, in 1917, and again in 1920, published very suggestive papers on "Hyperplasias of the Endometrium," in which he pointed out that there is much evidence in favor of the explanation of abnormal uter ine bleeding being a perverted physiology of the menstrual mechanism. He pointed out that in these cases of functional bleeding a very common histological finding is a glandular hyperplasia of the endometrium. Novak stated that in his experience this condition of the endometrium is never found except when uterine bleeding has been a symptom, but it may be associated with other lesions that are in themselves producers of abnormal bleeding, such as fibroids. He thinks that a common factor, likely ovarian, accounts for both the bleeding and the hyperplasia.

Geist in his study of hemorrhage from the myomatous uterus as well

as from the uterus free from neoplasms, comes to the conclusion that the bleeding is purely functional and brings forward evidence that the causative factor is likely ovarian.

From the above summary of the literature it is obvious that the histological findings in cases of idiopathic uterine bleeding vary in the experiences of different observers and there is no one constant finding: also that most writers are agreed that the majority of the

Fig. 1.—Photograph of two bleeding uteri taken side by side for comparison of size. Symptoms the same.

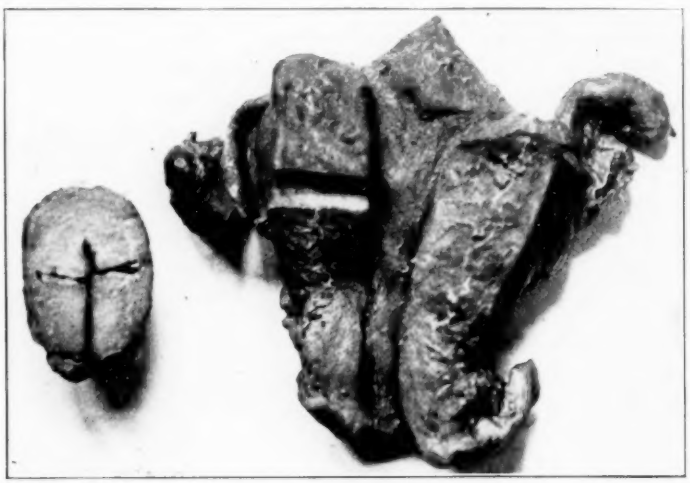

Fig. 2.—Photograph of two bleeding uteri taken side by side for comparison. The smaller uterus was so fibrotic it cracked from the pressure of a uterus holder used during operation.

cases are of the subinvolution type so well described by Goodall, in which the uterus is enlarged with a very thick wall and with both the muscular and fibrous tissue increased, although the relative proportion of these two tissues is about normal. The blood vessels are thick walled and there are large plaques of elastic tissue around many of them, the result of subinvolution. Most of the uteri that have been carefully studied histologically have been of this type, and having

made out these findings, it has been assumed that the bleeding depends upon them. But idiopathic bleeding also occurs from other types of uteri and it is not uncommon to find the small sclerotic uterus, or the large, soft and flabby one, bleeding just as profusely as the one that is typical of the so-called "fibrosis uteri." Moreover, it is possible to find many uteri exhibiting any or all of the described histological findings and yet not the seat of abnormal bleeding.

The series of cases that form the basis of this paper consisted of 126 specimens, all of which were stained by Weigert's method for elastic tissue and counterstained by Van Gieson's method for fibrous and mus-

Fig. 3.—Section from wall of uterus that was bleeding excessively. Patient's age 48. Para vi. Uterus enlarged with thick walls. Vessels are enlarged and thick-walled and contain an excessive amount of elastic tissue.

cular tissues. Of the total number, 92 were the seat of idiopathic bleeding and 34 were either not bleeding at all or were having normal menstruation. Let us consider the bleeding cases. Of these, 62 had the gross characteristics of the so-called fibrosis uteri. The walls were much thicker than normal and the blood vessels stood out from the cut surface as firm projections. Each uterus was considerably enlarged, was very firm in consistency, and the myometrium was streaked and mottled by what appeared to be strands of fibrous tissue. But there were also 16 of the bleeding cases in which the uterus was smaller than normal but firm in consistency. Finally there were 14 cases in which

the uterus was normal in size. Fig. 1 is a photograph of one of the large and one of the small uteri taken side by side for comparison. Fig. 2 is a similar case where the small uterus was so fibrous that the pressure of a uterus holder, used during the operation, was sufficient to crack the wall.

Not only are the gross appearances inconstant in these cases of bleeding, but the microscopic findings also vary greatly. The estimation of the normal proportions of fibrous tissue and of muscle in the wall of the uterus is a matter of individual judgment, but these specimens were stained to bring out the two tissues sharply, and in my estima-

Fig. 4.—Section from the wall of an enlarged, hard uterus removed for prolapse. Menstruation was normal and there was no evidence of pelvic inflammation. Patient's age 34, para ix. Vessels are very thick-walled and contain an excess of elastic tissue. Microscopical findings are those of "fibrosis uteri," yet there was no bleeding.

tion, out of the 92 bleeding cases, there was an increase in the proportion of fibrous tissue in the uterine wall in 34 cases, while there was less than the normal proportion in 2, and in the remaining 56 cases the proportions of muscle and connective tissue were normal. The appearance of the blood vessels was also inconstant. They were markedly thickened in 24 specimens, though the situation of these thickened vessels varied, in some instances being just under the mucosa and in others being found only in the deeper parts of the myometrium. In 34 specimens of bleeding uteri the vessels contained an excessive amount of elastic tissue or had masses of this tissue out-

side their walls, while the remaining 56 cases had vessels microscopically normal.

In view of the inconstant gross and microscopic findings in these cases of idiopathic bleeding, it appears improbable that the bleeding is actually caused by any one of these changes in either myometrium or vessels. This opinion is strengthened by a consideration of the 34 cases studied where the uterus was not the seat of excessive bleeding but was removed in the course of operation for prolapse or inflammatory disease. In this group 18 specimens were larger than normal, 6 specimens were smaller than normal and 10 were of normal size.

Fig. 5.—Same specimen as Fig. 4. Further illustration of the findings of "fibrosis uteri" without bleeding.

The microscopic findings varied as much as in the bleeding cases. There was an increase in the proportion of fibrous tissue in 20 cases and the proportion was normal in 14. The blood vessels were thickened in 24 specimens while in 16 they contained an abnormal amount of elastic tissue, either in the wall or just outside the wall. The vessels were normal in 8 instances.

We see then, that the histological findings of chronic metritis or fibrosis uteri, are not present in all cases of idiopathic uterine hemorrhage but, on the other hand, are found in a fair proportion of cases where there is no abnormal bleeding. This is illustrated by Fig. 3, which shows a section of wall from a large, hard, bleeding uterus, and

Figs. 4 and 5, which are sections from the wall of an enlarged uterus that had never shown any excessive or irregular bleeding. In both cases there are thick-walled blood vessels containing excessive amounts of elastic tissue, yet one uterus was bleeding excessively, the other was not. Fig. 6 shows a normal myometrium and normal vessels from a uterus that had severe and irregular bleeding. Fig. 7 shows a uterus that was very hard, smaller than normal, and had a myometrium containing a very large proportion of fibrous tissue but without any excessive bleeding. Fig. 8 shows these results in tabular form.

There was one histologic finding, however, that was more constantly

Fig. 6.—Normal vessels and myometrium from a normal sized uterus that was the site of very severe hemorrhage.

present in the bleeding cases than any other and that was a glandular hyperplasia of the endometrium. In the great majority of these cases the endometrium was much thicker than normal, though this is not always true. The glands are greatly increased in size and in number and large glands are often present just under the epithelium. Usually the stroma is also increased in amount and very cellular, but in other cases the picture is almost wholly one of glandular overgrowth with the appearance of an exaggerated, premenstrual activity. This condition is not found in all bleeding cases, but is present in a large proportion, 64 out of the 92 bleeding specimens examined showing it. I have yet to find a typical case of hyperplasia of the endometrium

unaccompanied by bleeding and, as Novak has pointed out, it is frequently found in cases of a neoplasm, such as a fibroid or an adenomyoma, if the patient is suffering from bleeding.

If, then, there be no constant histologic findings in cases of idiopathic uterine hemorrhage, and the bleeding does not depend upon changes in the myometrium or in vessels, how is it to be accounted for? In the absence of positive proof of its causation there are certain considerations that point to its being due to some aberration of the endocrine glands. In the first place, idiopathic hemorrhage occurs

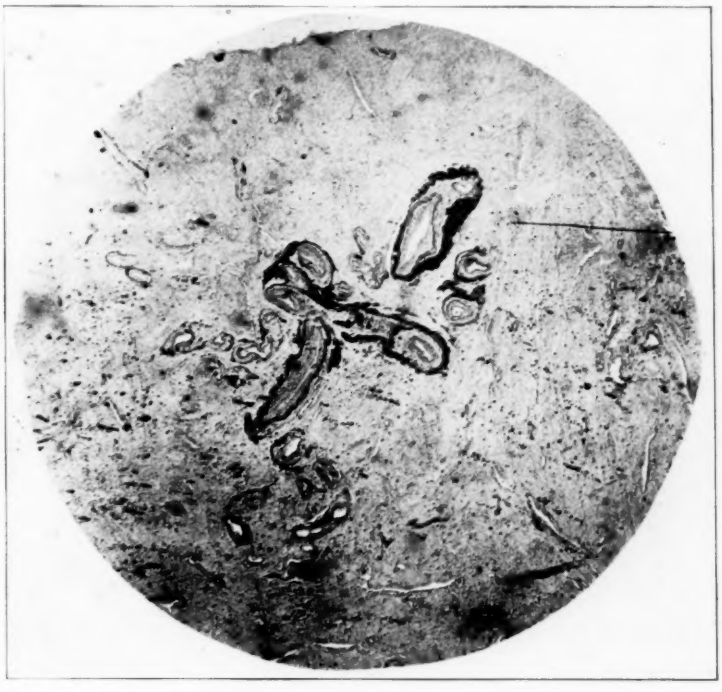

Fig. 7.—Section from wall of uterus smaller than normal and very hard. No irregular bleeding. Age 38, para iii. There is great increase in the connective tissue and the vessel changes are those of subinvolution.

only during the menstrual life of the patient and practically always starts as a menorrhagia, though it may develop into a metrorrhagia. Secondly, it occurs most frequently near the time of puberty or the menopause, and this is also the time when the action of the endocrine glands is most frequently abnormal. Thirdly, the condition sometimes clears up spontaneously and a normal menopause or menstrual history follows. Fourthly, certain ovarian conditions, such as lutein cysts, are commonly associated with both bleeding and glandular hyperplasia of the endometrium. Finally, the condition can be cured by x-ray or radium therapy, and the action of these substances is primarily on the ovaries.

Treatment, however, must be directed against the bleeding uterus, rather than the underlying endocrine disturbance. At least this is so during the present state of our knowledge regarding endocrine therapy. There are two methods of treatment that today yield satisfactory results; one is surgery, and the other is the employment of the x-ray or of radium. Proper surgical treatment consists of a subtotal hysterectomy, after the possibility of cancer of the body of the uterus has been eliminated. A few of these cases recover after repeated curettage, but their number is so small that such a form of treatment is not advisable. More and more, however, is the use of the x-ray, or radium coming into prominence in the treatment of these cases. The use of these measures demands a preliminary curettage to eliminate the possibility of cancer, but once that is done, they can safely be treated by the use of either of these substances, with almost certainty of cure in every case.

| | 92 BLEEDING CASES | PER CENT | 34 NONBLEEDING CASES | PER CENT |
|---|---|---|---|---|
| Large Uteri | 62 | 67.3 | 18 | 52.9 |
| Small Uteri | 16 | 17.3 | 6 | 17.6 |
| Normal Size | 14 | 15.2 | 10 | 29.4 |
| Increase in fibrous tissue | 34 | 36.9 | 20 | 58.8 |
| Normal fibrous tissue | 56 | 60.8 | 14 | 41.8 |
| Less than normal | 2 | 2.1 | 0 | 0 |
| Thick-walled vessels | 24 | 26.0 | 24 | 70.5 |
| Normal vessels | 56 | 60.8 | 8 | 23.5 |
| Excessive elastic tissue | 34 | 36.9 | 16 | 47.0 |

Fig. 8.

To summarize, therefore, the above points:

1. The histologic findings in cases of idiopathic uterine hemorrhage are not constant.

2. In the majority of cases, the uterus is enlarged, hard, and thick-walled, and contains an excessive amount of elastic tissue: the result of subinvolution.

3. But bleeding does occur in some instances, from uteri which do not show the gross or microscopic findings of subinvolution.

4. Not only may bleeding occur without these findings, but furthermore, the histologic picture of fibrosis uteri may be present without any abnormal bleeding.

5. The most constant histologic finding in bleeding cases, is one of glandular hyperplasia of the endometrium.

6. This glandular hypertrophy and the bleeding are likely due to a common factor, which is probably ovarian.

7. Treatment is preferably by means of x-ray or radium.

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75 Bloor Street East. (*For discussion, see p. 534.*)

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# OVULATION AND MENSTRUATION AS POSTOPERATIVE CONSIDERATIONS*

By Thomas J. Watkins, M.D., F.A.C.S., Chicago, Illinois

IT IS not my purpose to discuss this subject in detail as it has been so well done by others, especially by our Fellows, Graves[1] and Richardson,[2] but it is my intent to consider some practical features based chiefly upon personal observation.

Ovulation and menstruation as postoperative considerations are important because many of the pelvic operations affect these functions. The great diversity of opinion which exists relative to their importance is unfortunate as it frequently affects surgical judgment and must at times result in detriment to the patient and always in confusion to the student. The extensive studies of the endocrines which have been made and the vast amount of clinical data which has been acquired have added so much to our knowledge of the ovary that this continued state of confusion is not justified. Much of the difficulty is attributable to carelessness in recording and utilizing clinical data and to the fact that clinical research cannot be verified by "control" cases. The so-called "open mind to conviction" is so often mistaken for a mind of fixed opinion,—roofed, sided, and continuously calked to prevent leaks,—as to materially retard progress. A fixed opinion fails to be interested in, to observe, or to note conditions which cannot be utilized for calking purposes.

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*Read at the Forty-sixth Annual Meeting of the American Gynecological Society, Swampscott, Mass., June 2 to 4, 1921.

### OVUM AND CORPUS LUTEUM

The problem of the ovary relative to operative indications concerns the production of ova and ovarian secretion. Unanimity of opinion exists relative to conservation of the ovary when conditions obtain which are favorable to reproduction. Opinions vary much in regard to conservation of the ovary for secretion. The ovarian secretion during menstrual life has been proved to be an important part of the endocrine system. The physical changes that take place in the body at puberty and the menopause emphasize the importance of ovarian function. The usual good health which obtains after the menopause is completely established demonstrates the ability of the endocrine glands to compensate for the loss of ovarian secretion. Is there any objection to the production of a premature menopause exclusive of the possibilities of reproduction? The individual most concerned, woman, would generally answer in the affirmative. This opinion for psychologic reasons, aside from other considerations, demands recognition. It is impossible to estimate the relative severity of the neuroses of the artificial and natural menopause because "control" investigation is not possible, and because individual cases vary so much. My personal observations induce me to believe that the difference is negligible.

The problem of atrophy following the menopause is the one of greatest biological importance. Atrophy following the artificial is no more than after the natural menopause, but the latter is beyond our control. More or less atrophy necessarily follows loss of ovarian function, as growth and sustained growth require function. The loss of one lessens the other. Loss of the ovarian function necessarily causes atrophy in the tissues associated with it in function. Cases are occasionally seen of such extensive postclimacteric atrophy as to cause great physical discomfort and distress from fissures, erosions and irritating leucorrhea. Although the severe cases are infrequent, the others are of sufficient importance to demand serious consideration.

### CONSERVATION OF THE OVARY IN UTERINE FIBROIDS

No clinical or theoretical evidence indicates that excision of the fibroid uterus compromises the life or function of the ovaries unless they are so situated that the operation disturbs their blood or nerve supply. The menopause symptoms following hysterectomy with conservation of the ovaries, appear about the usual time. The ovaries also remain normal in size, determined by conjoined palpation. These observations are based upon an experience extending over some years of leaving the ovaries in favorable cases when excising the fibroid uterus.

We have had no instances that raised the suspicion of an increased liability of such ovaries to disease. I have no personal record of ovarian cysts developed in ovaries left after fibroid operations. It is reasonable that they should occur, but it has not been my experience to see them.

Observations in the treatment of small uterine fibroids with radium has induced us to generally limit the use of radium to cases past forty years of age; in younger women supravaginal hysterectomy has seemed preferable to destruction of the ovary by radium. The fact that with radium profuse bleeding occasionally occurs before amenorrhea is established, and that cessation of menses and arrest of growth is often temporary in younger women, is additional evidence in favor of supravaginal hysterectomy in such cases.

### CONSERVATION OF THE OVARY IN SALPINGITIS

The same evidence for and against conservation of the ovary in fibroids is applicable in case of salpingitis, except in salpingitis the cortex of the ovary is modified by inflammatory reaction. We have followed other surgeons in a gradual change from radicalism to conservatism of the ovary in salpingitis, as the importance of the functional value of the ovary has been developed. This experience has convinced us that sufficient ovarian structure can and usually should be left to conserve ovarian secretion. In the very severe cases of infection enough ovarian stroma is fortunately at times left incorporated in adhesions to functionate. Authentic cases are on record of the occurrence of pregnancy in such cases. Acute ovaritis, that occasionally follows salpingectomy, may result in considerable distress, may persist for some weeks, but will generally subside and cause no further trouble if treated with time, patience and encouragement.

Tradition and some other influences have developed very different surgical judgment for the male and female sex glands, although their function and diseases are somewhat similar. Enlarged prostates and uterine fibroids are analogous structures. Gonorrheal infection, pus tubes and sex gland contamination appear in man and woman. The sex discrimination in the surgical treatment of these diseases does not appear justified.

The following case illustrates the sex discrimination which exists even among the laity:

A husband and wife recently requested the operation of removal of the ovaries to prevent pregnancy. They were informed that sterility could be easily and safely obtained by a minor operation upon the husband. They were anxious to have the ovaries removed, but refused any operation upon the husband. There is a suspicion that our profes-

sion is not entirely devoid of this sex discrimination. Excision of the testes for enlarged prostate was never a popular operation. I recall a few instances of this operation performed on nonmedical men.

### NONCONSERVATION OF MENSTRUATION

Conservation of menstruation has no value aside from its relation to reproduction. Menstruation is a handicap Nature seems to have been obliged to impose upon woman for the accomplishment of pregnancy. It is part of the means of recovery of the uterus from the sorrow over the loss of the ovum. Menstruation is a menace to health and hygiene except for the purpose of reproduction. Absence of symptoms during the physiologic amenorrhea of pregnancy and lactation, and after amenorrhea following hysterectomy when normal ovaries are present, proves that menstruation has no functional value except in relation to reproduction. The handicap varies much, depending upon the amount of loss of blood and of systemic and pelvic distress. There is abundant clinical evidence that absence of menstruation, after removal of the body of the uterus, does not compromise the life or function of the ovary.

Experience has convinced me that menstruation should be abolished by excision of the body of the uterus in the course of abdominal pelvic operations when conditions obtain which make pregnancy impossible or inadvisable.

Our records show that operations for retrodisplacement of the uterus have become infrequent, generally not more than two or three a year. The uncomplicated cases are usually not operated; the operated cases generally have enough pathology to indicate supravaginal hysterectomy. Suspension of a heavy hyperplastic denuded uterus, especially if accomplished by menstrual disturbances, usually gives unsatisfactory results and not uncommonly necessitates subsequent abdominal section, which is always distressing to the patient, disappointing to the operator, and discrediting to surgery.

An abdominal section, that sacrifices by hysterectomy a poor chance for pregnancy, is preferable to one not sufficiently radical to give good assurance of cure. This type of cases demands that the operator have the clinical history well in mind at the time of operation, as individual surgical judgment is obligatory.

Conservation of menstruation should not be considered in fibroid tumors except in rare instances. My records of myomectomies have been very disappointing, menstrual disturbances have generally recurred, fibroids have often developed and most of them have required subsequent excision or radium. This result would be expected, as myomectomy does not remove the cause of the growth or the place of development, and is generally an incomplete operation. I question its

justification without advising the patient of the probabilities in prognosis.

There is a small group of women, a rather distinct type, that reminds one of Lincoln's Mississippi River boat. This boat was so badly constructed, that when it blew its whistle the boat stopped; when the boat was running it could not blow its whistle. This small group above referred to are so delicately constructed, that when they menstruate they are otherwise entirely incapacitated. They are the type of women for whom Battey[3] devised his operation of removal of normal ovaries and tubes to abolish menstruation. If supravaginal hysterectomy had been developed in Battey's time, he would have excised the whistle instead of the generator, and his operation would have lived and flourished. When this type of woman has a condition indicating abdominal section, menstruation should be abolished by excision of the body of the uterus. I refer especially to a group of cases who suffer from headaches, nausea, vomiting, pelvic pain or hemorrhage, or a composite of all these, and who are free from menstrual disturbances for only one or two weeks each month.

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104 South Michigan Avenue. (*For discussion, see p. 535.*)

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# RADICAL CONSERVATISM IN THE SURGICAL TREATMENT OF CHRONIC ADNEXAL DISEASE*

By Frederick C. Holden, M.D., New York, N. Y.

CONTRARY to the usual custom of a quarter of a century ago, the present practice is for the conservation of ovarian function whenever possible. Too frequently this desire has been fraught with disaster, necessitating a subsequent operation on account of cystic and painful ovarian tissue. If ovaries are to be conserved and functionate and not cause distress, it is important that adequate afferent and efferent circulation be maintained. The removal of a normal or slightly inflamed tube may be accomplished with little interference with the circulation of the ovary, but it is impossible to remove a grossly enlarged tube, without interfering with that circulation.

It was with this idea in mind, that the operation about to be described has been performed on twelve patients, between November 22, 1919, and November 17, 1920, on the Gynecological Service of Bellevue

*Read at the Forty-sixth Annual Meeting of the American Gynecological Society, Swampscott, Mass., June 2 to 4, 1921.

Hospital. This is a preliminary report, as the number is too small and the elapsed time too short, to permit of positive conclusions. The average age was twenty-three years and eight months, oldest twenty-nine, youngest twenty. All had normal temperatures and normal leucocytic counts for at least three weeks prior to operation and were suffering from the usual symptoms of chronic pelvic inflammatory disease, which

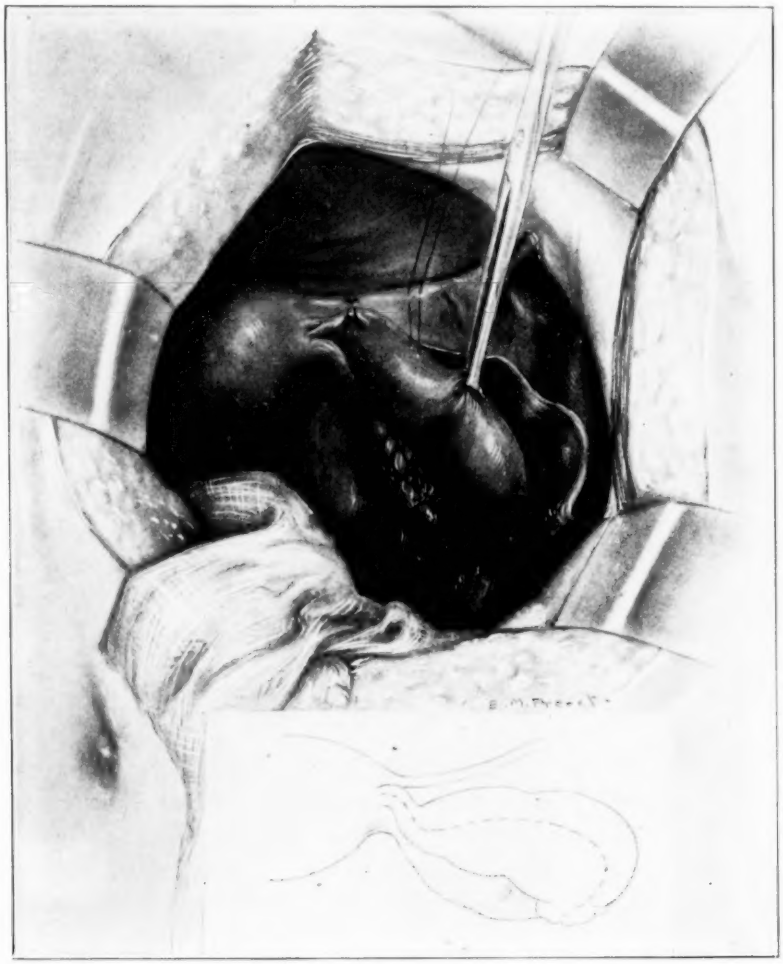

Fig. 1.

a rest period and local treatment had failed to relieve and which demanded operation for the relief of symptoms.

As to the operation itself, after severing adhesions, the inflammatory mass is brought into view, and is inspected to determine to what extent the diseased tissue shall be retained. Where one tube or ovary is apparently normal, and the other side the seat of a pyosalpinx, the diseased tube and the ovary are removed. There seems to be no justi-

fication for the retention of adnexa which are the seat of tuboovarian abscess.

The operation consists in the incision of the pyosalpinx along its anterior surface, from the clubbed end to the uterine cornua, which is best done with a sharp pointed, straight scissors. After a culture specimen is taken, the tube is wrapped in a hot, wet pad, while the other side is similarly treated. The bleeding of small severed vessels is controlled by fine suture ligatures. The incised tubes are so suspended to the round ligaments by three or four interrupted fine linen sutures, as to turn the raw surface of the incised tubes downward. The ovaries are suspended (Pool method) by drawing the peritoneum

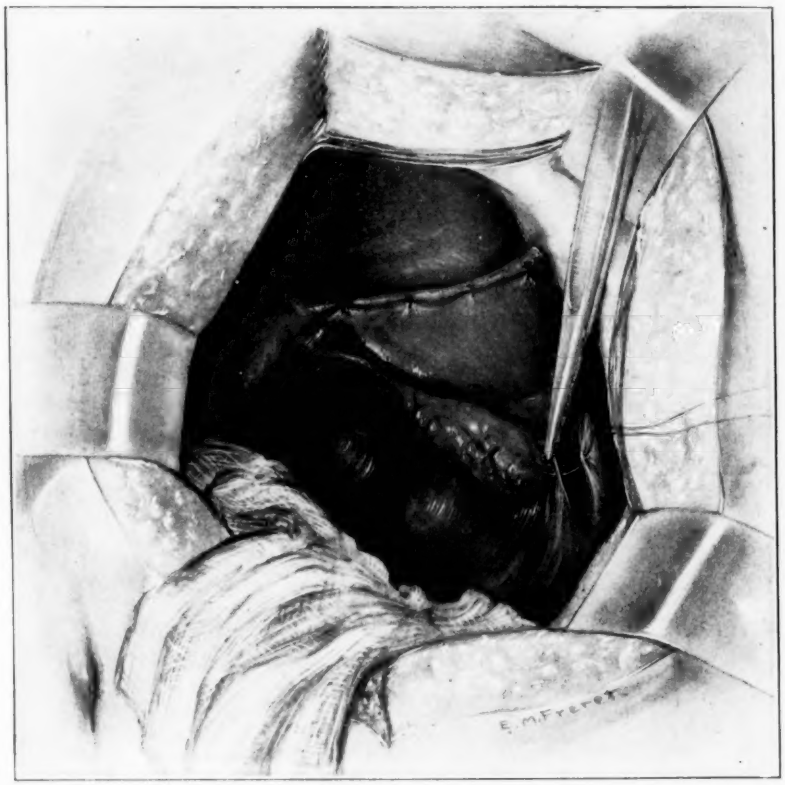

Fig. 2.

away from the side of pelvis and a fine linen suture is passed, uniting it with the peritoneum of the infundibulopelvic ligament, just as it reaches the ovary. The uterus is then suspended. The choice in this class of cases has been the Olshausen operation. Thus it will be seen that the retroverted uterus with its adnexa is freed, the tube or tubes incised and all so suspended that there is no chance that they can subsequently reach the culdesac.

The first case was drained through the vagina, the remainder closed without drainage. Cultures in all cases were negative. Each patient made an uneventful recovery with about the same postoperative morbidity which accompanies radical operations for similar pathologic lesions.

*Follow-up Notes.*—From the standpoint of postoperative care, the type of patients in this short series is obviously the very worst, inasmuch as most of them are women of the streets, and it has been impossible to alter their mode of living after leaving the hospital. All traces of three have been lost, but nine have been examined one or more times since leaving the hospital. Two have reentered the hospital after the operation with symptoms of acute exacerbation of chronic adnexal disease and which were relieved by the usual treatment for acute salpingitis. In all those examined it has been possible to palpate the conserved tubes, which were not specially tender. Five of the nine were free from pain, and four had pain of varying degree in one or both sides, which did not incapacitate them.

## CONCLUSIONS

1. It has been demonstrated that pyosalpinges may be incised and suspended without mortality or excessive morbidity.

2. A young woman with chronic adnexal disease, when physically disabled, and not responding to several weeks' rest and treatment, should be offered a choice between radical operation with its surgical menopause, and conservation with its possibility of reoperation.

3. In the event of conservation of ovarian tissue being decided upon, the technic described in this paper may be of benefit.

13 EAST SIXTY-FIFTH STREET.

(*For discussion, see p. 535.*)

# THE DISPOSITION OF THE UTERUS FOLLOWING SALPINGECTOMY WHERE IT IS DESIRABLE TO PRESERVE MENSTRUATION*

By Carey Culbertson, M.D., F.A.C.S., Chicago, Ill.

IT IS not desired to open the question as to the advisability of preserving menstruation, but rather to limit the contents of this paper to a discussion of the disposition of the uterus where the tubes have been removed and where it is possible to preserve some ovarian tissue. I am firmly convinced that it is an advantage to maintain menstrual function, particularly where the patient is young and has not borne children. The menstrual function is one of the features of normal health, and anything which tends to preserve normal health is desirable in the cure of pelvic disease in women.

Our present knowledge of the physiology of the uterine mucosa leads us to regard menstruation as a retrograde process, a mere bleeding out of a structure that has become edematous and highly vascularized. Inasmuch as this vascularization indicates a high stage of function on the part of a lymphoid structure such as the corpus mucosa is, we must regard the premenstrual edema as the expression of function rather than the actual hemorrhagic phase. Without ascribing to the corpus mucosa the importance of a ductless gland, we cannot say until we know more regarding the importance of specific cellular activity, that its function is of no value.

While the tubes are removed for a variety of lesions, in the great proportion of cases their removal is indicated by inflammatory disease which has destroyed them as oviducts and which is so extensive as to make it reasonably doubtful that their function can be restored by operative procedure. That this operation is indicated chiefly in young women is due to the fact that it is chiefly in young women that the infectious processes destroying the tubes are acquired.

In 518 cases tabulated according to age, on which this argument has been prepared, 321, or 62 per cent, occurred between the ages of eighteen and twenty-nine; between the ages of thirty and thirty-eight, 139, or 27 per cent, of these infections occurred. Before eighteen and after thirty-eight the number of cases was relatively negligible, though they varied from fifteen years to fifty-two years of age.

The preservation of the uterus, too, depends, as has been intimated, upon ovarian conservation and upon a second factor, that is, a uterus

*Read at the Forty-sixth Annual Meeting of the American Gynecological Society, Swampscott, Mass., June 2 to 4, 1921.

that is not too badly diseased. Uteri which contain multiple fibroid tumors or which are suppurative in themselves are to be sacrificed in the great proportion of the cases.

The series referred to consists of 518 cases of general pelvic peritonitis involving the tubes which were treated by abdominal section. In this series both tubes were removed 445 times; one tube was removed 52 times; and both tubes were left in the remaining 21 cases. Of these 445 cases wherein both tubes were removed, hysterectomy was performed 199 times, leaving 246 cases, or 55 per cent, wherein some disposition *in situ* had to be made of the uterus.

In a survey of this material we may discuss four possibilities.

*First*, the uterus may be left alone. In my experience this is rarely applicable. In the first place, the uterus is often already displaced, either as a result of the diseased condition for which the operation is performed or as the result of some other pre-existing factor. Of the 518 cases referred to, the uterus was retroverted 199 times, or 38 per cent. It was fixed in retroversion 150 times and it was free 45 times. In 10 of these cases the uterus was in first degree and in 3 cases in second degree procidentia. The uterus was upright in 319 instances, fixed in 266, and free in the remaining 53. The removal of the tubes, therefore, and the breaking up of the adhesions so often weakens the broad ligaments that the uterus, even where it is already upright, is left in a condition of mobility, as a result of which it would be reasonable to expect it to become retroverted. Besides this, the uterus is in nearly every case involved in some degree of metritis, as a result of which it is enlarged, soft and boggy. This change is most evident, as Bell has pointed out, in its upper portion, so that even where it is upright prior to operation this condition provides another factor for bringing about subsequent retrodisplacement. Further, the menstrual disturbance which so often characterizes pelvic peritonitis is most apt to persist where retroversion is permitted. Therefore, in the large number of cases in which the uterus is already retroverted I do not believe it is desirable to leave it in such a position. It is true that retroversion of the uterus *per se* does not always bring about pathologic changes in the organ itself, but such displacement is a certain factor in the production of pathologic conditions, such as pelvic varicosities, ovarian congestion, procidentia, and of symptoms such as pain in the pelvis, backache, bearing down, and hemorrhage. Furthermore, particularly in pelvic peritonitis, it is desirable to leave the pelvis free from all raw peritoneal areas after the removal of the tubes, and the peritoneal surface of the uterus is in nearly every instance so involved as to defeat the purposes of peritonization. It is true that in a few cases the uterus may be so free from adhesions, so movable, so small, and in such a normal position with such excellent tonicity of its liga-

ments that it may be left without any particular procedure being employed to maintain it where it should remain, but it is equally true that in the great majority of cases such circumstances do not obtain, and it is, therefore, necessary to undertake some procedure aimed at maintaining the uterus in its normal relation to the other pelvic structures.

The *second* method of treating the uterus consists in some method of

Fig. 1.*—The tube masses have been freed and are held up with the fundus of the uterus from which the round ligaments have been ligated. The fundus of the uterus is being amputated. *A*. The line of amputation—anterior and posterior wall. *B*. Line of amputation from a lateral aspect.

round ligament shortening. I have long been of the opinion that shortening of the round ligaments should be reserved for cases where pregnancy is to take place in the future, that is, in simple retroversion where the tubes are not diseased or where but one tube has been re-

*This and the following illustrations are from an article by the author, published in The Surgical Clinics of Chicago, W. B. Saunders Co., October, 1919, iii, No. 5, p. 1290.

moved. In the series of 518 cases just referred to, one tube was left 52 times; both tubes were left 21 times. Round and uterosacral ligament shortening was resorted to 52 times, either for the purpose of replacing the uterus where it had been retroverted or of covering raw areas on the uterine wall. Shortening of the ligaments as a means of overcoming retrodisplacements of the uterus, regardless of the method employed, is attended by a certain percentage of failures. In ligament shortening we are merely doing the best we can with the material at our disposal and this material is not always of the best quality. The ligaments are lax and attenuated or at times infiltrated and not readily freed. In addition, ligament shortening is poorly employed where the uterus is metritic, or where it is enlarged as the result of general fibrosis or of the presence of fibroid tumors. Fibrosis was present in 54 of the 199 uteri removed, and fibromyomata in 80.

The *third* method of disposing of the uterus is the one that is probably the most generally employed throughout the various surgical clinics of this country. I refer to ventral fixation, where the fundus of the uterus is fastened to the anterior abdominal wall by some method or other. This procedure leaves the uterus relatively immobile in a position that is abnormal. It forms a pillar in the lower mid-abdomen, renders peritonization difficult or impossible, and like the other two methods it requires that the entire uterus be left except for such portion of the cervix as may have been dealt with by plastic operation. Here again the metritic uterus responds poorly to such treatment, fibromata and fibrosis contraindicate the procedure and the menstrual disturbances are apt to persist. It is safe to say that secondary operation for removal of the uterus more often follows ventral fixation than any of these other procedures.

The method which the writer favors or wishes to emphasize at this time consists in the removal of the entire fundus of the uterus, a procedure which leaves a small organ that can be entirely covered by peritonization and which leaves the organ in its normal position, capable of maintaining menstruation in a degree sufficient to satisfy the physiological and psychologic requirements and at the same time not be subject to subsequent excessive bleeding. Such an operation was described in 1913 by Blair Bell and about the same time by Buettner. Buettner's operation is based on the principle inculcated by Fauré, that operation upon the adnexae should be from the midline toward the pelvic wall. After first ligating to prevent hemorrhage but leaving the round ligaments attached, Buettner excises the fundus uteri by transverse wedge-shaped incisions, the wedge being split mesially and each piece freed from its broad ligament. The wound in the uterine cavity is then sutured. The fallopian tubes were removed from below upward and from within outward. The parietal

peritoneum from the anterior abdominal wall or from the urinary bladder was then sutured to the upper posterior wall of the uterus just back of the line of incision, thus bringing the uterus into permanent, mobile anteflexion. The advantages of this procedure, as claimed by Buettner, are that menstruation is assured, the possibility of a chronic

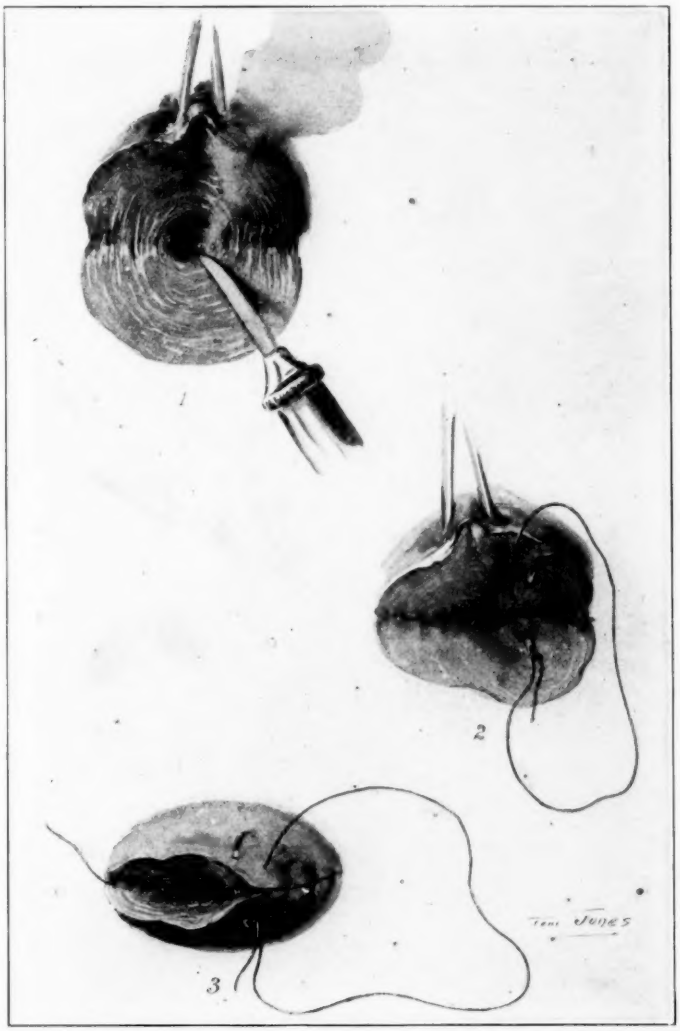


Fig. 2.—*1.* The exposed mucosa is lightly seared with the cautery directly after the fundus of the uterus has been amputated. *2.* The first line of suture closes the uterine cavity by bringing the anterior and posterior uterine walls together, the catgut passing through musculature only. *3.* A continuation of the preceding, carrying the suture back and bringing together the edges of the uterine walls.

metritis is obviated, and menstrual disorders disappear, the flow becoming normal in amount and duration.

Bell's procedure differs in some details. After removal of the tubes and possibly one ovary, Bell excises the fundus of the uterus by ante-

rior and posterior incisions from above downward and inward, the ascending branches of the uterine artery are caught, and the anterior and posterior flaps are sutured together by mattress sutures. The cut edges of the mesocervix on one side and the broad ligament on the other are sewn together and the lower ligatured stumps inverted between the layers of peritoneum. The uterine ends of the round ligaments are then sutured with fine silk to the top of the uterine stump and the ligament of the remaining ovary is attached to the round

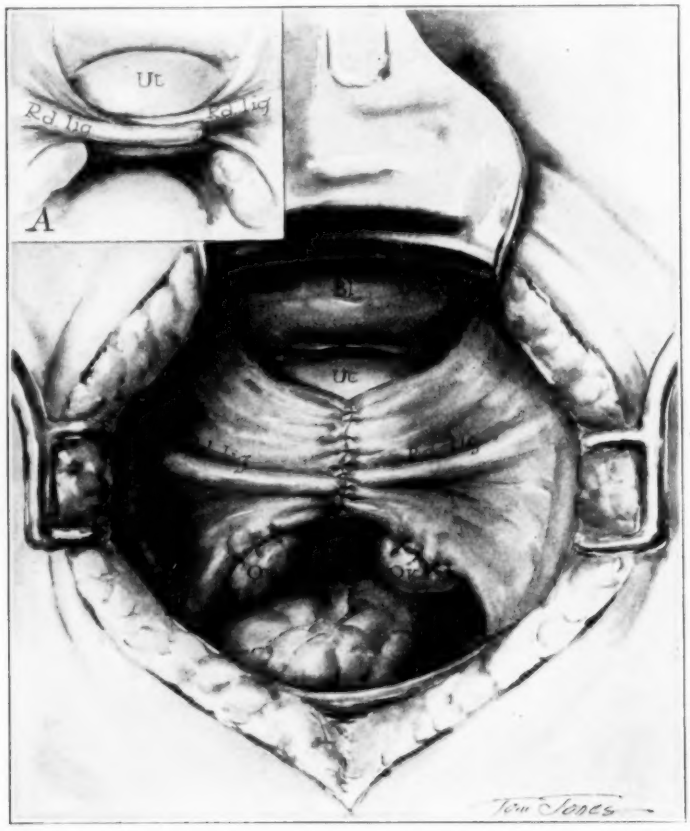


Fig. 3.—After suturing the uterine walls together the round ligaments are imbricated across this new fundus, the right one to the left side and the left one to the right side, as in *A*. The slackened broad ligaments are then brought together from side to side, anteriorly and posteriorly. Each ovary is suspended to its broad ligament. The pouch of Douglas is left open where there are no extensive areas of raw or infiltrated tissue.

ligament on its own side. The operation described by Polak in his recent monograph is a modification of the Bell-Buettner technic, emphasis being placed upon conservation of the ovarian blood supply.

Of the 445 cases in which both tubes were removed the uterus was treated as follows:

In 199 operated cases it was removed. Ventral fixation was performed 41 times, but it should be noted that this procedure was

employed only in the earlier cases of the group. In recent years its use has been exceptional. Round ligament shortening was not resorted to in any case, neither was the uterus left unsupported. In 219 cases the uterus was treated by a modification of the operation as described by Bell and Buettner, without following the principle of Fauré.

The tubes are removed by ligature and excision from their infundibulo-pelvic reflection towards the center. The round ligaments are then ligated close to the uterus and cut away and a second ligature is passed through the broad ligament on each side to catch the fundal branches of the uterine artery. These in turn are cut, leaving exposed

Fig. 4.—Where extensive raw or infiltrated areas are present in the pouch of Douglas, this space is entirely closed over with the sigmoid flexure and rectum.

the entire fundus of the uterus with the two diseased tubes attached. Excision is carried out by transverse incisions anteriorly and posteriorly, from above downward and inward. This removes in the majority of the cases fully one-half of the corpus uteri by bulk but preserves all of the corpus mucosa except that small portion lining the fundus. I estimate that not more than 25 per cent of the corpus mucosa is ever removed by this procedure, and it has never been necessary to ligate the uterine artery. The anterior and posterior flaps are then sutured together with running catgut in two stages, the first

closing the uterine cavity and the second bringing into approximation and closing the edges of the wound. With the stump of the uterus now held lightly by a volsellum forceps at its central point, the left round ligament is picked up and sutured into the right horn by an over and over linen thread and the right round ligament into the left uterine horn. This overlapping of the round ligaments is readily effected and quite covers the entire raw edge left in suturing together the two edges of the uterine wall. It also takes up whatever slack may be present in the round ligaments and puts the anterior and posterior layers of the broad ligament on the slack. This renders the next and final step in peritonizing the organ readily possible. With a thread of fine catgut on a round curved needle the broad ligaments on either side are picked up on the level of what would correspond to the anterior culdesac and sutured together from side to side, thus covering the anterior wall of the uterus as far as the round ligaments. The same suture unites the round ligaments at the midpoint of the new fundus and is then carried on down approximating the posterior layers of the broad ligament from either side, the final stitches fastening the broad ligaments securely to the posterior uterine wall as low down as may be desirable. The posterior culdesac is left open if there are no raw peritoneal surfaces, but if extensive raw areas do exist, the culdesac is blocked off by the so-called high sigmoid flexure peritonization. This procedure leaves a small uterus in normal position entirely covered anteriorly and across its fundus by clean peritoneal folds and at the same time it reinforces the transverse septum that is normally present in the pelvis. Peritonization is completed by suspending each ovary to the broad ligament on its respective side in such a way as to roll under the raw edge left by the removal of the tube as far as the infundibulopelvic ligament. In all respects this treatment of the uterus is similar to Bell's "acro-hystero-salpingectomy" except in the method of peritonization which requires freeing the round ligaments. In my opinion imbrication of the round and approximation of the broad ligaments from side to side over the uterus is superior to the method described by Buettner. I do not believe that the fundus is removed amply enough to satisfy the advantages set forth by Bell or Polak without first freeing the round ligaments.

If the uterus has been in retroversion and the cervix continues to swing too far forward, shortening of the uterosacral ligaments is carried out exactly as is done in association with round ligament shortening for simple uterine retroversion.

The advantages of such disposition of the uterus after bilateral salpingectomy are that the uterus continues to menstruate and its fundus which, as Bell has pointed out, is the most infected portion of the corpus uteri, is removed.

In only exceptional cases have the round ligaments been so infiltrated on one or both sides as to render imbrication impossible. In such cases I have fastened each ligament into the uterine angle on its own side and then covered the fundus of the uterus with vesical peritoneum as described by Buettner, or where the posterior culdesac has been raw, I have brought the appendices epiploicae of the sigmoid flexure up over it.

The treatment of the cervix depends, of course, upon its condition. In many of these cases the cervix shows the redness and swelling of a cervicitis. In that proportion of cases in which the cervix is appreciably involved in chronic inflammatory processes or where it has been lacerated by childbirth, it is amputated preferably by mid or high amputation, otherwise it is let alone.

While fixation of the uterus into the abdominal wall was used in the early years of my experience, this procedure has been virtually abandoned in favor of the operation of defundation as here described. In other words, today I either take out the uterus or amputate its fundus, the latter method being reserved for the young and particularly for the childless. Patients operated upon as long ago as 1913 are still menstruating. There has been little or no dysmenorrhea complained of and in not one instance has the follow-up revealed a premature menopause or a continuance of excessive uterine bleeding. On the contrary the menses are scanty in amount and their duration from one to three days. The problem of leucorrhea remains, but it always will remain as long as the cervix remains. After reposition of a displaced uterus the congested cervix readily clears up, as was pointed out by Sir J. Y. Simpson years ago. This is particularly true after removal of suppurating tubes. The discharge is much less in amount, is less constant and in numerous cases is no longer noticed by the patient.

While it is not the purpose of this paper to take up in detail the problem of the disposition of the ovary, it will be of interest to note that of the cases in this tabulation both ovaries were removed 85 times. In these cases, of course, the uterus was always removed. One ovary was left 281 times. Of the 85 bilateral oophorectomies, autotransplantation was performed but 9 times. In 5 cases no ovarian tissue was to be found on one side. Bilateral ovarian resection was carried out in 46 cases and unilateral resection in 146 cases. The microcystic ovary I no longer resect. In none of the cases seen subsequently has it been necessary to operate for removal of the ovary or of the defundated uterus, whereas five hysterectomies have later been performed out of the 41 cases treated by ventrofixation. Preservation of ovarian tissue prior to the menopause years is invaluable to the patient, and I am fully convinced that better results are obtained where the ovary

is left in its normal situation with its normal blood supply than where it is removed and transplanted elsewhere.

The conclusions offered as a result of this study are:

*First.* Ventral fixation of the uterus has objections which render it an undesirable procedure in association with removal of both tubes.

*Second.* That round ligament shortening is unsuitable where the tubes have been removed and should be reserved for the simpler uterine displacements where pregnancy is to follow.

*Third.* That the reduction of the uterus in size by removal of its entire fundus is a ready method of disposing of the organ after salpingectomy where, particularly in young women, it is desirable to preserve menstruation. Defundation becomes a logical procedure not only in operating for the cure of infectious processes, but also for simple sterilization, for ectopic pregnancy, ovarian cystomata and like conditions. Its only contraindication from a technical point of view is that of procidentia uteri.

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30 North Michigan Avenue. (*For discussion, see p. 535.*)

# CONCERNING TORSION OF THE UTERINE ADNEXA OCCURRING BEFORE PUBERTY, TOGETHER WITH A CONSIDERATION OF TORSION OF NORMAL ADNEXA. REPORT OF A CASE AND A REVIEW OF THE LITERATURE SINCE 1900*

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CONCEDING for the moment that the torsion of normal uterine adnexa is an accepted fact, a classification of the different types of adnexal torsion may be made as follows:

I. Pathological Adnexa.
  (1). Torsion of ovarian tumors.
    (A). Before puberty.
    (B). After puberty.
      (a). In the nonpregnant state.
      (b). During pregnancy and the puerperium.
  (2). Torsion of tubal tumors including hydrosalpinx, hematosalpinx and pyosalpinx.

II. Normal Adnexa.
  (1). Within the abdomen.
    (A). In the nonpregnant state.
    (B). During pregnancy.
  (2). Within a hernial sac.
    (Not to be confused with simple strangulation.)

That ovarian tumors in the adult, especially cysts, are very prone to undergo torsion of the pedicle, is well known to gynecologists and to medical men in general. Such a complication giving rise, as it frequently does, to violent and serious symptoms, has provoked considerable interest and given rise to an extensive literature upon the subject. The accident is by no means an infrequent one. A. Martin[9] reports that 5 per cent of the ovarian tumors upon which he has operated were the subject of torsion, and B. Küstner[9] reports 47 per cent. Such figures, inexact as they are in showing how frequent the complication is, at least demonstrate that the subject is important and justify a critical study of every phase of it.

Viewing the whole topic of torsion of the uterine adnexa in a comprehensive way we may classify it conveniently as we have done at the beginning of this article. It will be noted that the most important items are already well known or have at least been well covered in

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other papers. Anspach's[1] article discussing a less common phase is full of interesting facts and is the best we have found on the twisting of tubal enlargements. He has reviewed and summarized 88 reported cases and has distinctly advanced our knowledge of this condition.

There are some phases of the subject as a whole in which professional experience has been relatively small. Among them we may properly place torsion of the uterine adnexa in childhood, and that of normal appendages. In the literature of the past 20 years we have been able to collect but 25 instances of torsion of ovarian tumors before puberty. Our interest in the subject was aroused by the observation of the following case, which before the examination by the pathologist seemed to be one of torsion of a normal uterine appendage and which we believe yet might properly be discussed as such. The small cyst that was found had not materially changed the size of the ovary so that this has led us to a consideration of the twisting of normal adnexa.

M. M., age nine, entered Blodgett Memorial Hospital on May 28, 1920, with the diagnosis of acute appendicitis. Four days previous to admission the child had been seized with severe pain in the right lower quadrant. She vomited the evening of the day of the onset and this was repeated once or twice on each of the two following days, ceasing on the fourth day. She had been given no food since the beginning, except a little broth after the vomiting ceased. The pain continued in moderate severity and was intermittent. She had some pain when she evacuated the bladder. Had never had any previous similar attacks. The physical examination showed a well-nourished child, normally developed for her age. The child appeared moderately ill. Temperature on entrance 101.° Pulse 126. Respiration 26. The abdomen was very slightly, if any, distended, and there was a suggestion only of rigidity confined to the right lower quadrant. There was well defined tenderness in this area. Her abdominal cutaneous reflexes were all present. A slight dullness was noted in the right lower quadrant, but no mass could be made out. Rectal examination showed a tender, indefinite mass or fullness in the right side of the culdesac rather high up. Urinalysis showed albumin and a few leucocytes in the urine. Blood count showed 14,000 leucocytes and the differential count, polymorphonuclears 84, large lymphocytes 6, and small lymphocytes 10. Although the lack of rigidity was somewhat unusual, we could only conclude that she was suffering from an acute appendicitis. She was operated upon at once.

*Operation.*—The usual gridiron incision in the right lower quadrant. On opening the abdomen a small amount of bloody exudate escaped, coming apparently from the pelvis. A firm mass was found on the right side which proved to be the tube and ovary twisted in such a way as to completely block the circulation of both. It was black in color. The mass was about the size of the average normal adult ovary. It was brought to the surface, the pedicle untwisted and ligated, and the mass removed. The uterus was small and undeveloped. The opposite adnexa were palpated, and a small, apparently normal ovary identified. During the removal of the right appendage the appendix came into view. It was slightly edematous, but no more so than the surrounding parts. It was removed and the abdomen closed without drainage. The patient made an uneventful recovery, leaving the hospital 14 days later.

*Pathological examination* by Dr. Geo. L. Bond, shows that the tissue consisted of a dark mass densely infiltrated with blood which had undoubtedly increased its size

to a considerable extent. The mass measured 4 cm. x 6 cm. There was a small cyst present in the mass 3.7 cm. x 2.1 cm. The whole mass was about the size of the average adult ovary. Between the cyst and the tube there was a distinct membrane, probably the outer wall of the cyst. Microscopically the tube wall was infiltrated with round cells and leucocytes. The tube was edematous and the vessels filled with blood. The ovarian structure was lost, being replaced by partly organized clots. The cyst wall was formed of old, dense, edematous, fibrous tissue, and epithelial cells could be distinguished in its surroundings. The exact nature of the cyst could not be determined, but it resembled an ordinary follicular one of the ovary. The appendix showed periappendiceal changes, with great thickening of the peritoneal coat. There was no reason to believe that an acute appendicitis existed, the changes in the appendix undoubtedly being secondary.

We have collected, as above stated, twenty-five other cases of torsion of ovarian tumors before puberty, which we have abstracted and reviewed.

CASE 1.—Harrigan: Am. Jour. Obst., 1915, lxxi, 808. Age twelve. Seen four days after the onset. Complaints were abdominal pain and persistent vomiting. Rigidity present over the lower abdomen. Rectal mass palpable. As to diagnosis, appendicitis, tuberculous peritonitis and ovarian cyst were considered. At operation an orange sized cyst of the left ovary was found that had undergone two complete turns. The right ovary was congested. Tumor was a cystadenoma. Recovery.

CASE 2.—Bornstein: Jour. Am. Med. Assn., 1909, liii, 1102. Age fourteen. Never had menstruated. Prodromal symptoms for three months. Then an acute attack with pain in right iliac region. Repeated vomiting and distention. The preoperative diagnosis was acute appendicitis. Operation. A large cystic tumor of the right ovary twice the size of a man's head was found. Twisted once. Recovery.

CASE 3.—Loving: Jour. Am. Med. Assn., 1908, l, 1350. Age six. Child previously well. Acute onset. Complaints were pain in the epigastrium and a pressing desire to urinate. Abdomen rigid and tender. Tumor in hypogastrium reaching to umbilicius. Operation. Large unilocular cyst of the right ovary twisted 1½ times. Measured 12.5 by 10.5 by 35 cm. Weight 640 grams. Recovery.

CASE 4.—Swainson: Proc. Roy. Soc. Med., London, 1909-10. iii. Sec. Stud. Dis. Child, p. 72. Age two. Complaints. Abdominal pain and vomiting for four days. Abdomen rigid and distended. Tumor in right iliac fossa. In the diagnosis, intussusception, tuberculous peritonitis and appendicitis were considered. Operation. Strangulated ovarian tumor the size of a tangerine orange. Type not stated. Recovery.

CASE 5.—Sutcliffe: Lancet, London, 1907, ii, 772. Age three. Violent abdominal pain and vomiting for one day. Tumor in middle of abdomen. Operation. Cocoanut-sized adenoma of the right ovary twisted four times was found. Recovery.

CASE 6.—Thellung: Cor.-Bl. f. Schweiz. Aerzte, Basel, 1908, xxxviii, 490-5. Age 8. Two attacks had occurred respectively 15 months and 3 months before the one leading to operation. Complaints. Pain in the right lower quadrant and vomiting of three days' duration. Tumor in ileocecal region and moderate rigidity. Preoperative diagnosis, perforated appendix with abscess and peritonitis. Operation. Small amount of blood tinged exudate. Fist-sized right ovarian cyst twisted once. Right tube and uterus also twisted, the latter at the level of the cervix. Recovery.

CASE 7.—Angus: Brit. Med. Jour., 1906, i, 199. Age six. Abdominal pain and vomiting for three days. Abdominal distention and dullness above pubes and in

right flank. Operation. Dermoid of right ovary the size of a duck's egg. Twisted 2½ times. Tip of appendix attached to the mass. Fell out of bed after operation and never regained consciousness. Death. Autopsy negative.

CASE 8.—Vineberg: Med. Record, 1915, lxxxvii, 586. Age nine. Complaints. Abdominal pain and vomiting. Rigidity and tumor mass to the umbilicus. Preoperative diagnosis. Twisted ovarian tumor. Operation. Large cystadenoma twisted two times. Recovery.

CASE 9.—Goldstine: Surg., Gynec. and Obst., 1920, xxx, 627. Age twelve. Had an attack two months previous to present one. Complaint, abdominal pain. Preoperative diagnosis. Ruptured appendix. Operation. Ovarian cyst twisted two times. Recovery.

CASE 10.—Hodgson: Univ. Durham. Coll. Med. Gaz., London, 1916, xvi, 104. Age eleven. Onset sudden. Complaint. Pain in right lower quadrant accompanied by vomiting. Mass felt in right iliac fossa, just above the pelvic brim. Rectal examination showed a mass in the pouch of Douglas. One previous attack about two weeks before present trouble. Preoperative diagnosis. Appendicitis with abscess formation. Operation. A dermoid cyst about the size of a cocoanut with a long pedicle was found which had become twisted. Recovery.

CASE 11.—Sourdat. Rev. Mens. de Gynéc. de Obstét. et de Pediat., Paris, 1912, vii, 131-133. Age 12. Complaint. Abdominal pain and vomiting of two days' duration. Abdominal tumor the size of a child's head. No ascites. Child's abdomen had been enlarging for more than a year and at times she had complained of vague abdominal pains. Preoperative diagnosis. Ovarian cyst with torsion. Operation. A dermoid cyst the size of an adult head and containing about two liters of straw-colored fluid, with a pedicle twisted one-half turn was found. Recovery.

CASE 12.—Eisenbuch: Gynäk. Rundschau, Berl., u. Wien., 1917, xi, 233:248. Age ten. Onset sudden without previous symptoms. Complaint. Abdominal pain followed by vomiting. Palpable tumor in the lower abdomen the size of an apple. Preoperative diagnosis. Twisted ovarian tumor. Operation. Small amount of ascitic fluid escaped. A hard, fist-sized dermoid tumor of the left ovary twisted 180° to the right was found. Recovery.

CASE 13.—Nagel: Zentralbl. f. Gynäk., 1912, No. 22, p. 714. Age five. The case was demonstrated before the Gynecological Society of Berlin as a twisted ovarian tumor. It was about the size of a child's head and there was beginning necrosis. The cyst was a dermoid.

CASE 14.—Roll: Abstracted by Eisenbuch. Age eight and one-half. Had attacks of severe abdominal pain at times for three years lasting up to 12 hours. Seemed to depend on bodily exertion. Usually disappeared after the bowels had moved. Finally pain persisted in spite of bowels having moved, and there developed the symptoms of a peritonitis. Rectal examination showed a movable tumor. Preoperative diagnosis. Twisted ovarian cyst. Operation. Peritonitis present. Left ovary kidney-sized. It consisted of a brownish black hematoma. Pedicle twisted three times from left to right. Right ovary small and cystic and larger than an adult ovary. Its infundibulopelvic ligament was 5 cm. long. Recovery.

CASE 15.—Roll: Abstracted by Eisenbuch. Age seven. A sister of the previous patient. For one year had similar complaint to that of her sister. Usual symptoms of torsion made a laparotomy necessary. Operation. The left ovary consisted of a necrotic hematoma. Right ovary was cystic and about twice the normal size. Recovery. In each of these two cases the right appendage was sutured to

the pelvic wall in order to prevent a repetition of the accident due to unusually long ligaments. In each case further examination showed the cysts to be dermoids.

CASE 16.—Selzer: Abstracted by Eisenbuch. Age eight. Complaint. Abdominal tumor. Preoperative diagnosis. Appendicitis or localized peritonitis. Operation. A left-sided ovarian dermoid was found with torsion of the pedicle. Recovery.

CASE 17.—Nagel: Ztschr. für Gynäk., 1904, liii, p. 580. Age eight. Complaint. For three days there was abdominal pain, vomiting and obstipation, accompanied by abdominal distention. For one year the child had abdominal pain at times and the parents noticed some increase in the size of the abdomen. Operation. A twisted ovarian dermoid the size of a child's head was found. Torsion of 180°. Recovery.

CASE 18.—Heaton: Brit. Med. Jour., 1901, ii, p. 1559. Age eight. Had several previous attacks of abdominal pain. Complaint. For five days lower abdominal pain, vomiting and tenderness in lower abdomen. Tender tumor mass in right iliac fossa. Operation. A unilocular cyst of the left ovary twisted 4½ times was found. Recovery.

CASE 19.—Askanazy: Abstracted by Eisenbuch. Age nine. Complaint. Abdominal pain. At operation a twisted dermoid cyst was found.

CASE 20.—Karazewski, A.: Medycyna, Warszawa, 1903, xxxi, 598:625. Age ten. Child constipated since birth. During the seventh year had quite severe pain in the left side of the abdomen, after a long period of obstipation. Some improvement after heat to abdomen and enemas. Child had repeated attacks of this trouble once or twice a week, pain lasting 5 to 10 minutes. In the three years previous to operation had three severe attacks. Finally while in school was struck in the abdomen by the elbow of another child. Next day complained of severe pain in the left lower quadrant. Enema gave a small amount of hard stool. Vomiting ensued and the pain became worse. Was given castor oil which resulted in a small liquid stool. Abdomen not distended. Considerable rigidity of the abdominal muscles. Distended coils of intestine were noted. Tenderness in the left lower quadrant. Preoperative diagnosis. Intestinal obstruction. Operation. Colon came into the wound as a sausage-sized mass, filled with fluid and the sigmoid was found to be twisted. The anus was dilated after the sigmoid was untwisted and yellowish foul-smelling fluid was evacuated per rectum. Above the symphysis lying against the abdominal wall there was a tumor of the left ovary which was twisted, the pedicle consisting of the tube and the broad ligament. Tumor was an ovarian dermoid. Removal. Recovery.

CASE 21.—Meigs: Boston Med. and Surg. Jour., 1900, Lancet I.* Abstracted by Eisenbuch. Age ten. No previous symptoms. The child fell from a box and later developed intense abdominal pain which increased in severity. Also showed signs of shock. The abdomen was tender and tympanitic. Preoperative diagnosis. Kinking of the ureter with hydronephrosis. Operation. Under anesthesia a tumor about the size of a child's head below and somewhat to the right of the navel was found. A dermoid of the right ovary twisted 1½ times was found and removed. Recovery.

CASE 22.—Owen, E., and Green, C.: Brit. Med. Jour., 1904, ii, 1517. Age ten. Complaint. Enlargement of the abdomen, abdominal pain and vomiting. Operation. Under the anesthetic the uterus was found to be displaced to the right and a tumor noted reaching almost to the umbilicus. A cocoanut-sized ovarian dermoid which was twisted 1½ times from the left to the right was found and removed. Patient's condition was good for five days and then she had a convulsion. On the

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sixth day developed symptoms of a bowel obstruction and was re-operated. A piece of ileum was found adherent in the pelvis. It was released. Recovery.

CASE 23.—Freund: Zentralbl. f. Gynäk., 1919, iv, 76. Age thirteen. Onset sudden. Complaint. Severe pain in the lower abdomen, lasting three days. Developed peritoneal symptoms. Abdomen distended. Rectal examination showed a small anteflexed uterus and a left-sided tumor about the size of a child's head. Operation. Considerable blood in the peritoneal cavity and a large coagulum was found in the culdesac. The uterus was partially bicornuate. The right ovary was quite large. Right tube normal. On the left side there was an ovarian tumor with its pedicle twisted 2½ times toward the right. It was full of blood and about twice the size of an adult fist. The left tube was twisted with the ovary and there was some blood in the tube. Removal. Recovery.

CASE 24.—Christel, K.: Zentralbl. f. Gynäk., 1919, xliii, 302. Age five. Complaint. Severe pain in the abdomen and vomiting. Tumor palpated in the lower part of the abdomen in midline. Preoperative diagnosis. Twisted ovarian cyst. Operation. A right-sided ovarian dermoid with torsion of the pedicle was found. It was about twice the size of an adult first and infiltrated with blood. Recovery.

From a review of these cases, including our own, we obtain the following data. In age they range from two to fourteen. About 50 per cent occurred between the ages of eight and ten inclusive. The ovary alone was twisted in the majority of instances. In Case 6 the tube, ovary and the uterus to the level of the cervix were involved in the torsion. A volvulus of the sigmoid with intestinal obstruction was produced in one (Case 20). The type of tumor, dermoid, 15; simple cyst, 5; cystadenoma, 2; adenoma, 1. In two the nature of the tumor was not designated. It occurred nine times on the right side, with three others probably right; on the left nine times; four not given. Accordingly we have a proportion of about four to three in favor of the right side which corresponds roughly to Sanes'[9] figures on twisted tumors in adults (3 right to 2 left) and Anspach's[1] figures as to twisted tubal enlargements. In the majority of instances where it has been noted the torsion is in accordance with Küstner's law. This states that right-sided tumors twist from right to left, and left-sided tumors from left to right. The tumors varied in size from two reaching above the umbilicus to one the size of a walnut, one the size of a duck's egg, and our own about the size of an adult ovary. Opposite adnexa were normal in four cases; not mentioned in seventeen; stated to be congested in one; and in Case 23 the opposite ovary was described as "large." It is interesting to note that in each of Roll's cases occurring in sisters, the opposite ovary was cystic and there was an unusually long ovarian ligament. In both of these cases he sutured the remaining ovary to the lateral pelvic wall to prevent a similar accident upon the opposite side. The appendix was involved secondarily in two instances. In one the tip was attached to the pelvic mass and in the other it was somewhat edematous.

As regards symptomatology, there is little variation from similar

accidents occurring in adults—an acute abdominal crisis with pain, nausea and vomiting, prostration of varying degrees, tenderness, rigidity and distention, presence of tumor, increased pulse rate, temperature and moderate leucocytosis in cases where a blood count was made. These occurred variously combined and in different degrees as will be seen by looking over the case reports. It is to be noted the leucocytosis in such a crisis cannot be used to distinguish the case from one of inflammatory origin.

The occurrence of bladder symptoms in three cases of this series is rather interesting. Although there are innumerable instances of twisted ovarian tumor in the adult reported in the literature, Sanes[9] was able to find only nine cases that presented any bladder symptoms. He states that in five urination was painful and that in four it was difficult and frequent. The occurrence of these symptoms seems to be more frequent in children. In Case 1, the mother stated that the "urine had been cloudy for the past two days and that urination seemed painful." In Case 3 the attack was accompanied by a pressing desire to urinate and the patient was up all night trying to empty her bladder. In our case the patient had some pain on evacuating the bladder. It is common observation that many abdominal crises in children are attended rather frequently by disturbances of urination.

The diagnosis is difficult, chiefly because of the rarity of these cases and the similarity of their symptoms to those of other acute abdominal crises. The presence of a well-defined tumor is probably the most distinguishing mark that we have. A correct preoperative diagnosis was made in one-third of the cases. About one-third were diagnosed as acute appendicitis. In one case appendicitis, tuberculous peritonitis and cyst of the ovary were considered; in another kinking of the ureter with hydronephrosis; a diagnosis of intestinal obstruction was made in Case 20, and this was really present due to a volvulus of the sigmoid which complicated the torsion of the cyst.

We know of no way to estimate how frequently children with ovarian tumors suffer this complication. Such tumors in children are, of course, uncommon although Haubert* in 1911 collected two hundred of them from the literature. In his list there were 59 dermoids, a large proportion. In the 25 cases above reported 15 were dermoids.

The cause of torsion in children seems to be much the same as in adults and this has been thoroughly discussed elsewhere in the literature. However, it has been noted that this accident occurs frequently in association with the menstrual period, or during pregnancy and the puerperium and these factors are, of course, excluded in children.

The greater frequency of torsion on the right (3 to 2) Anspach[1]

*Quoted by Harrigan. For reference see Case 1.

thinks is due to the greater roominess of the pelvis on the right side by virtue of the sigmoid being on the left and to the fact that the peristaltic action of the cecum and small gut is greater than that of the sigmoid and thus adhesions about the right adnexa are broken up more readily. He believes that the strangulation of normal tubes is almost inconceivable, but is barely possible if there is an abnormally long mesosalpinx, one or two accessory ostia, or greater length and thickness of the tube than usual. He makes no statement relative to the possibility of torsion of a normal ovary. This is at least more readily conceivable and surely not so difficult of proof.

In view of the fact that the ovary in our case was found at operation to be about the size of an adult ovary, and undoubtedly had been materially increased in size by extravasation of blood due to its twisting, we have considered the matter of torsion of normal appendages (both tubes and ovaries) and have reviewed the literature of the same. The ovary had been made larger than the ordinary one of childhood by what we believe was a small follicular cyst (3.7 x 2.1 cm.), but this was hardly large enough to classify it as a distinct tumor. In considering the matter of torsion of so small an appendage one must, it seems to us, reckon with the length of the mesentery and the relative size of the ovary or length of the tube. The tube or ovary may be histologically what we deem well within the normal, and yet be mechanically predisposed to torsion. Norris has suggested that an unusually large, heavy ovary may pull away from its attachments far enough to produce a condition similar to a pedicle. Auvray in 1912 in a series of three articles in which he reported two cases and reviewed all of those reported up to that time, has presented the most complete exposition of this subject that we have been able to find. His report includes six cases of torsion of the normal adnexa in the nonpregnant state and three cases during pregnancy. One of these is possibly open to question (Case 2). Since that time five cases have been reported which are included in the summary below: namely, those of Barrington, Munroe (two), Johannson and Schweitzer. At the time of Auvray's article only one case had been reported in the American literature. This naturally gives rise to speculation as to whether we have not overlooked this condition. Since that time in our literature there has appeared the article of Munroe, in which he reports two cases of torsion of normal ovaries in girls of ten and eleven years. Munroe states that the size of the ovaries was that of a lemon or small orange. Since no histologic examination was made, it leaves some doubt in one's mind as to whether they should be included in this group. Since, however, he reported them under this title we have done so.

Herewith is presented a short résumé of the claimed cases of torsion of normal adnexa.

IN THE NONPREGNANT STATE

*GROUP I. TUBE.*

CASE 1.—Stark: Jour. Obst. and Gynec., Brit. Emp., 1911, xix, 258. Age forty-six. Unmarried. Menstruation still regular. Three attacks of lower abdominal pain, all occurring a day or two after cessation of menstrual flow. Examination showed an unruptured hymen and on the right side of the uterus a firm mass about the size of an ordinary tomato. No preoperative diagnosis made. Operation. Few free blood clots found. Left fallopian tube twisted from right to left three distinct and complete turns. Fimbriated ends filled with blood clots. Tube removed together with ovary which was normal. The mass removed from the right side was a separate tumor imbedded between the layers of the broad ligament. It proved to be a dermoid. Microscopic examination of the removed tube showed no evidence of pregnancy. Recovery.

CASE 2.—Auvray: Arch. Mens. d'Obst. et de Gynée., 1913, ii, 97-104. Age twenty-eight. Virgin. Menstruation began at 13. Entered hospital with diagnosis of acute appendicitis. For two years had at intervals some cramp-like pains in the abdomen, mostly on the right side with a tendency to syncope. Present complaint. Right-sided abdominal pain and vomiting. The menses appeared on the third day of the attack. Vaginal examination was impossible. Operation. At the end of three weeks. Tip of the appendix was attached to the mass in the pelvis. The latter was the size of a mandarin orange. The ovary was normal and not involved in the torsion. The mass consisted of the tube twisted three times and distended with black bloody fluid. Pathologic examination showed some inflammatory changes including round cells and giant cells. These changes were considered secondary, but on the whole leave some doubt in one's mind as to the genuineness of this case. Recovery.

CASE 3.—McIlroy: Jour. Obst. and Gynec. Brit. Emp., 1910, xviii, 368. Age forty-six. Widow, 4-para. Complaint. Severe pain in left iliac region accompanied by sweating and collapse. Some prolapse of the uterus for past few years and menstruation had been irregular, the last period having occurred four months previously after an amenorrhea for one year. Mass noted in culdesac about the size of a large orange. Immovable and tender. Slight tenderness and rigidity in the left iliac region. Preoperative diagnosis. Incarcerated fibroid of the uterus and a tubo-ovarian tumor were considered. Operation. Left hematosalpinx with two complete twists was found. No free blood in the peritoneal cavity. The ovary was fibrous and was not involved. The opposite ovary appeared congested but otherwise normal. Recovery. Detailed pathologic examination failed to reveal any trace of chorionic villi or placental tissue.

CASE 4.—Schweitzer: Zentralbl. f. Gynäk., 1918, xlii, p. 25:33. Age twenty-one. Single. Never pregnant. Complaint. Severe pain in left lower quadrant, which subsided but did not entirely disappear. Five days later there occurred a more severe attack coming at the time of the menstrual period. Examination. On the left side near and behind the uterus was a tense tumor about the size of an apple which was not freely movable. Preoperative diagnosis. Left ovarian cyst with torsion. Operation. There were many adhesions about the tumor which was removed, leaving a healthy ovary. The tumor consisted of the left tube twisted two times to the left. The opposite tube and ovary were normal. The mesosalpinx, however, was about twice its normal length and the outer end of the tube reached downward far beyond the ovary. Recovery. Pathological examination. The tube showed only those changes which could be plainly accounted for by its torsion. The tube contained a dark reddish-brown fluid which was sterile. It had a rather long mesentery.

*GROUP II. OVARY.*

CASE 5.—Norris: Am. Jour. Obst., 1911, lxiii, 850. Age nineteen. Unmarried. Menstrual history negative. Onset three days before a period. While sweeping was seized with a sudden sharp pain in the right lower quadrant. Vomiting ensued. Was seen in half an hour and was in a state of partial collapse. Both recti were rigid, the right being more so. Hymen intact. Rectal examination. To the right and posterior to the uterus was a tense, fairly hard kidney shaped tumor about the size of a lemon. Preoperative diagnosis. Twisted ovarian tumor. Operation. The right ovary was about twice the normal size and twisted on itself 180°. The tube was congested and rotated about 40° in the same direction. No free blood. Salpingo-oophorectomy done. Recovery. Pathologic examination. This showed the tube to be normal. The lumen was patent and contained a little blood. The right ovary was 6 cm. by 2.3 cm. by 4 cm. No adhesions. There was a small cyst 4 mm. in diameter at the inner pole. This was a graafian follicle cyst. The ovary was densely infiltrated with blood. The appendix was normal.

CASE 6.—Barrington: Jour. Obst. and Gynec., Brit. Emp., 1916, xxvii, 141. Age thirty-eight. Married. 12-para. Developed a sudden pain in the abdomen while walking upstairs. This became quite severe and located in the right lower quadrant. Vomiting and diarrhea began in 15 minutes. Continued for 24 hours. On deep pressure tenderness was noted in the right lower quadrant. A mass was noted on rectal examination. Operation. An excess of clear fluid was found in the peritoneal cavity which was not blood-stained. Appendix normal. A tense, elongated mass was found behind the uterus on the right side at the bottom of the culdesac. This consisted of the right ovary and distal part of the right tube twisted on its pedicle one complete turn. No adhesions. The ovary and a portion of the tube were removed. The ovary was 6.5 by 3.5 by 3 cm. after hardening.

CASE 7.—Johannson: Nord. Med. Ark., Stockholm, 1917. L. afd., i, No. 4, pages 1-14. Age six. Eleven days before entrance had a short attack of pain in the right side of the abdomen. One week later a more severe attack with vomiting. Slight tenderness over the region of the appendix on deep palpation. No rigidity. Preoperative diagnosis. Acute appendicitis. Operation. Considerable blood escaped through the incision. Appendix normal. Right ovary enlarged four or five times and blue black in color. Its pedicle was twisted once, and part of the tube was also twisted. Opposite adnexa were normal. Right salpingo-oophorectomy was done and also an appendectomy. Recovery. Pathologic examination. This showed the tube to be swollen and edematous, but otherwise negative. The mesovarium was unusually long. Microscopically the ovary consisted of a complete hemorrhagic infarct and no details were possible. No cyst was present in the ovary. Considered a normal ovary previous to the torsion.

*GROUP III. TUBE AND OVARY.*

CASE 8.—Auvray: Bull. Soc. d'Obst. et de Gynéc., 1912, i, 727-731. Age fourteen and one-half years. Virgin. Menstruation began at 13. No previous symptoms. Entered with the diagnosis of acute appendicitis. Complaints. Right-sided abdominal pain and vomiting. Menstruation began on the third day of the attack. Operation. After an interval of three weeks. The right tube was found twisted two times on itself. No trace of any adhesions. Tube and ovary removed. Recovery. Pathologic examination. The fimbria were agglutinated together and both the tube and ovary were infiltrated with blood. There was no trace of chorionic villi or placental tissue. The diagnosis was torsion of a normal tube and ovary.

CASE 9.—Cassidy and Norbury: Lancet, London, 1911, i, 98. Age eleven. Complaint. Acute abdominal pain confined to the lower abdomen and worse on the left side than on the right. Vomiting. Pain on micturition and defecation. Similar

attack about three months previously. Tenderness present all over the lower abdomen, but chiefly in the left iliac region. Rigidity of the lower recti. Rectal examination showed a mass in the culdesac a little to the left of the midline. Preoperative diagnosis. Appendiceal abcess. Operation. A little blood stained fluid in the pelvic cavity. The uterus, the right fallopian tube and the right ovary were normal. The left ovary was found to be twisted with the corresponding broad ligament and fallopian tube was also twisted several times. Tube and ovary removed. Recovery. Microscopic examination of the ovary showed only extreme vascular engorgement.

CASE 10.—Munroe: Jour. Med. Assn. Georgia, August, 1917, p. 169. Age eleven. Onset sudden with pain in the right lower quadrant, nausea and vomiting. Some rigidity. On the fourth day a mass was felt below McBurney's point. Temperature 101.5, pulse 120, preoperative diagnosis. Appendiceal abscess. Operation. Fifth day. Appendix distended and inflamed, probably secondarily. In the pelvis a black looking mass about the size of an orange was found which consisted of the tube and ovary twisted several times at the junction of the tube with the uterus. Tube and ovary removed. No gross abnormality. Opposite adnexa were normal. Recovery. No microscopic examination was made.

CASE 11.—Munroe: Ibid. Age ten. Gave history of previous mild attacks suggesting appendicitis. Complaint. Colicky pain in the right lower quadrant persisting for about nine days. Temperature 102°. Pulse 120. Lower abdomen somewhat rigid. Mass felt in the right iliac fossa. Preoperative diagnosis. Appendiceal abscess. Operation. Appendix was slightly inflamed and was removed. Below this a dark-colored mass about the size of a lemon was found. This represented the tube and ovary attached by a twisted pedicle to a very small uterus. Tube and ovary removed. Opposite adnexa were normal. No gross disease of tube or ovary. Recovery. No microscopic examination was made.

*GROUP IV. DURING PREGNANCY.*

CASE 12.—Aulhorn: Zentralbl. f. Gynäk., 1910, No. 16, p. 538. Age nineteen. Never previously pregnant. Three months pregnant at time of attack. Several weeks before had slight pain in right lower abdomen which became better after a time. Complaint. Severe pain in the right lower abdomen of two days' duration. Abdominal rigidity present. Vaginal examination showed a fist-sized tumor which seemed to be on the right side. Preoperative diagnosis. Pregnancy with pyosalpinx was considered to be the most probable one. Operation. In the right side of the pelvis was found a distended tube and a large ovary twisted 180°. Pathologic examination showed the tube to be distended with clotted blood. The wall of the tube was thickened by hemorrhagic infiltration. The ovary was densely infiltrated with blood, but otherwise negative. Recovery.

CASE 13.—Lecene: Ann. de Gynée., July, 1912. Abstracted by Auvray. Age twenty-one, 2-para. Five months pregnant. Complaint. Had intermittent pain in lower abdomen since the beginning of the pregnancy. Suddenly developed pain in the right lower quadrant, diarrhea and vomiting. There was tenderness in the right lower quadrant and rigidity. Indefinite mass in this region. Preoperative diagnosis. Appendicitis. Operation. The right tube was found twisted on itself two times. Ovary not involved. Appendix negative except for old adhesions. The lumen of the tube was normal except for dilatation. The wall showed only hemorrhagic infiltration. Recovery.

CASE 14.—Hartmann: Ann. de Gynée., 1898, 1, 167. Abstracted by Auvray. Age twenty. Complaint. Vomiting, pain in the right lower quadrant, distention and obstipation. Preoperative diagnosis. Acute appendicitis. Operation. Twenty-four hours after onset. The uterus reached to the umbilicus. On opening the

abdomen some fluid escaped. The right adnexa formed a hemorrhagic looking mass and were twisted one full turn. The tube was patent and normal except for infiltration of blood. The ovary was the size of an orange. It was infiltrated with blood which had not originated from a ruptured graafian follicle. Recovery.

A review of these cases yields the following data:

Eight of the fourteen cases, more than half, occurred before the age of twenty; four of them under twelve, and presumably before menstruation had been established. The two oldest patients were forty-six years of age. In five cases the tube alone was involved in the torsion; in eight the tube and ovary, although in three of these the most distal portion of the tube only, the ovary being the essential factor in the torsion; in Case 9 the tube, ovary and broad ligament. The torsion occurred on the right side ten times and on the left four. The opposite adnexa were normal in seven; described as congested in one; and was not mentioned in five. In one case there was a dermoid cyst in the opposite broad ligament and in another the mesosalpinx on both sides is stated to be unusually long. The symptoms were the usual ones of torsion already commented on in this article. One-half of the patients had had previous attacks attributed to incomplete torsion. More than one-half the cases were diagnosed as acute appendicitis. Of the three cases operated during pregnancy all went to term.

Excluding those instances which occurred before puberty and during pregnancy, five out of the seven remaining occurred in close relation to the menstrual period. This is striking and would seem to give support to the theory of Payr[8] who experimentally showed that venous congestion in a pedicle is conducive to torsion. This has been described at some length by Anspach.[1] Payr injected the veins of the pedicle of a spleen that had been removed from the body and was able to produce a torsion of 125°, which he attributed to the fact that the veins of a pedicle are longer and more flexible than the arteries and under the influence of passive congestion assume a spiral course and so tend to impart a twisting motion to the tumor.

The subject may be divided into three groups, (1) torsion of the tube alone; (2) torsion of the ovary (which usually includes a small portion of the distal part of the tube); and (3) torsion of both. The views of Auvray[2] on the subject of torsion of the normal tube are interesting. He inquires as to whether the rarity of the condition is apparent or real. Many instances of twisted hematosalpinx have doubtless not been subjected to a thorough and adequate microscopic examination. In both of his cases he has the word of the pathologist that there were no chorionic villi or placental remains found. The congestion and hemorrhage into the tube were considered as being due to the torsion. The examination must of necessity be very thorough in order to positively exclude an ectopic as it may be rather easily overlooked. In

Case 8, (Auvray) the patient was a virgin of fourteen years and the tube was open so that any possibility of previous hydrosalpinx could be ruled out. Eight of the eleven cases occurring in the nonpregnant were in virgins which eliminates ectopic pregnancy from consideration. On the other hand Anspach[1] is of the opinion that in such cases the tube is probably the seat of a hydrosalpinx before torsion and that it is converted into a hematosalpinx as the result of twisting. He believes that a hydrosalpinx in virgins and in cases in which there is no history of previous pelvic infection may be the sequela of a gonorrheal vulvovaginitis in childhood which persists in latent form until puberty and then produces involvement of the tube which is not recognized. Again he says it may be residual following an unrecognized salpingitis in the course of a febrile, especially the exanthematous diseases, or it may be due to an attenuated tuberculous infection. The question then as to torsion of a normal tube seems to remain an open one, and Auvray makes a plea for careful histologic examination in cases of twisted hematosalpinx.

The cases reported of torsion of the normal ovary are more susceptible of proof and it is very difficult to dispute the histologic evidence presented in these cases. As to why a normal tube or ovary or both should become twisted, Auvray is somewhat in doubt, but thinks that possibly all the causes which bring about torsion of tubal enlargements and ovarian tumors must be included. Abnormal length of the tube or of the mesosalpinx or mesovarium would certainly also be a factor. It is conceivable that a slightly enlarged and prolapsed ovary which we may regard in the strict sense as nonpathologic, could become twisted. Auvray believes that a spiral course of the tube, which is normally present in fetal life and may persist as a congenital anomaly in the adult to a marked degree may be a predisposing factor. Under the influence of the passive congestion of pregnancy or the menstrual period (and eight out of the ten cases after puberty so happened) he thinks that the tube may increase in volume, may twist still more and go on to complete torsion according to the theory of Payr. All this, of course, is merely speculation, and is impossible to prove. Perhaps further study of these rare cases will throw more light on the subject.

The torsion of normal adnexa in hernial sacs represents the final subdivision of adnexal torsion. Auvray[2] has summarized fifteen of the twenty cases reported by Damianos in 1905 and adds two other cases. Heineck[5] in 1912 collected five cases of torsion of the ovary and eighteen cases of torsion of the tube and ovary in hernial sacs from the literature of the preceding twenty years. This accident represents a true torsion, and must not be confused with a simple strangulation of the adnexa in a hernial sac. Heineck states that so far as he has been able to determine, torsion of the pedicle has been observed only in

congenital hernia of the inguinal type. Auvray states that it may occur at the time of the first appearance of the hernia, or in those already established. It is decidedly an accident of infancy. The oldest reported case was five years and the youngest one month. Almost all of them, with four or five exceptions, occurred during the first year. It is of about equal frequency on each side. Pathologically the same changes occur as in torsion within the abdomen.

The clinical picture presented is usually that of an atypical strangulated omental or intestinal hernia. Obstipation is usually absent, and the general condition in most cases is not so serious. Neither is the condition so inclined to be progressive or persistent. Lecene's case was not seen until the fifteenth day and Damianos' not until the sixteenth. One case was operated three months after the torsion occurred. Rectal examination may be of considerable assistance in the diagnosis in that in infants the internal ring can often be palpated by this method. In only one case were the adnexa in such condition that it was impossible to return them to the abdominal cavity. There was no operative mortality.

## SUMMARY

1. Torsion of ovarian tumors is an uncommon occurrence in childhood, as shown by the fact that only 26 cases, including our own, have been reported in the literature since 1900.

2. About 50 per cent occurred between the ages of eight and ten.

3. Sixty per cent of them were dermoids.

4. The tumors varied in size from that of an adult ovary to one reaching above the umbilicus.

5. The symptoms are those of an abdominal crisis similar to that of the same accident in adult life, sudden abdominal pain, vomiting, a variable degree of prostration, tenderness, rigidity, distention, temperature, increased pulse rate, and the presence of an abdominal tumor.

6. The diagnosis is usually difficult, probably due to rarity. Appendicitis is often the preoperative diagnosis.

7. The causes are much the same as in adult life.

8. Fourteen claimed cases of torsion of normal adnexa have been reported to date.

9. Eight of fourteen cases, more than half, occurred before the age of 20; four under 12, and presumably before puberty.

10. The tube alone may be involved, the tube and ovary together, or the ovary may be essentially the offending organ.

11. A large percentage occur in close relation to the menstrual period.

12. Three are reported during pregnancy.

13. Some question still exists as to whether a normal tube can undergo torsion, but it seems to be proved that a normal ovary may do so.

14. Factors such as the length of the mesentery, the size of the ovary, and the length of the tube, must be considered as well as the histologic structure of the organ.

15. Torsion of adnexa in hernial sacs (apart from strangulation) is relatively rare. It occurs only in congenital inguinal hernias and usually in the first year of life.

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(*For discussion, see p. 544.*)

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## MANAGEMENT OF ABORTION FROM A STUDY OF 530 CONSECUTIVE CASES*

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MY ONLY justification in presenting this paper for your consideration is that the conservative treatment of abortion, as we understand it, is not now in general use. Patients aborting at home are rarely treated conservatively, and but few hospitals follow absolutely the conservative treatment. The opinions expressed in the following paper are drawn from a careful study of five hundred and thirty cases admitted to the gynecologic service of Bellevue Hospital during a period of thirteen months ending March 1, 1921. Having treated so large a number of cases over so short a period of time, we feel that our observations may be of value. Abortion in this paper will refer to all interrupted gestations prior to the period of viability. We have considered abortion under two main headings: 1. Aseptic, 2. Septic abortions, and three minor headings: 1. Threatened, 2. Inevitable, 3. Incomplete abortions.

The abortion is considered septic if the temperature goes above 101° F. by rectum. It is also considered a septic case if there is a history of induction of the abortion or any subsequent intrauterine interference. The abortion is considered threatened if there is but moderate uterine hemorrhage, and no effacement of the cervical canal; inevitable if there is profuse bleeding especially if associated with

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rhythmical uterine contraction, or if there is effacement of the internal os or partial protrusion of the ovum.

Our treatment has been primarily conservative and the form of treatment depends upon the type of abortion we are dealing with, namely; threatened, inevitable or incomplete, and aseptic or septic. Threatened abortions, which constitute a practically negligible number of hospital cases, but a very considerable number of home cases, are treated by absolute rest, the rest being maintained by morphine sulphate in one quarter grain doses given hypodermatically. This type of case, as a rule, within twelve or eighteen hours becomes either an inevitable abortion or the pregnancy continues as a normal one. The inevitable or incomplete case is the type constituting by far the largest number of our series. They have been treated in the following manner.

Patients, upon admission, are shaved and the vulva prepared as for labor. No examination is made prior to this aseptic preparation. They are then examined vaginally in the lithotomy position, using a bivalve speculum, and if any of the products of gestation are found in the vagina, or protruding from the cervix, they are removed by sponge stick. No packing is introduced unless there is considerable bleeding. Should there be considerable bleeding, which will occur in something over 70 per cent of the cases, the patient is packed. All cases classified as inevitable or incomplete abortion, whether they require packing or not, are given pituitrin in one-half c.c. doses every two hours for four doses. The packing is done with the patient in the lithotomy position without anesthesia and under strict aseptic precautions. The vagina is tightly and thoroughly packed through a bivalve speculum, using two inch strips of plain gauze. I wish to emphasize the necessity of tight and thorough packing. Many of our abortion cases are admitted with gauze or cotton floating about in the vagina, but I cannot recall a single case admitted during the past year that had been properly packed. The lack of proper packing is, I believe, one of the prime reasons for the omission of the conservative treatment of abortion. The packing is removed from the vagina in from twelve to twenty-four hours and in about 80 per cent of the cases requiring packing, sufficient of the products of gestation will be removed from the vagina with this packing to avoid the necessity of subsequent packing. Should marked bleeding recur, which will happen in less than 20 per cent of the cases, a second packing is applied in a manner exactly similar to the first. A very small percentage of our cases required packing more than twice and none were packed more than three times. Should the case continue to bleed following the second or third vaginal packing, and this will occur in something less than four cases in one hundred, curettage may then be indicated. We have already found that as our care in the management of these cases improves, the number requiring inter-

ference (and by interference I mean any intrauterine manipulation) grows less and less. We have found that in cases with moderate bleeding continuing over some time there is frequently a retrodisplacement which we have overcome, at least temporarily, by the use of a retroversion pessary and when this has been done, the bleeding soon ceases. All of our abortion cases are instructed to lie upon the abdomen at least eight hours in twenty-four, for we feel that this position favors both drainage and involution. Our patients are allowed out of bed the day after the bleeding ceases and unless there is some special contraindication, they are discharged from the hospital two days later if not bleeding. I have thus attempted to describe briefly the management of aseptic cases whether threatened, inevitable or incomplete. What of the septic cases?

We regard, after this method of classification, about one-sixth of the cases as septic. We are convinced that conservative treatment is proper in the aseptic cases, and being convinced of this fact, intrauterine manipulation of any kind is not permissible in the septic cases. In none of the septic cases was there any intrauterine manipulation or irrigation. We consider septic cases to be those in which the battle is entirely between the leucocyte and the organism, and any intrauterine interference, no matter how slight, will favor the organism by disturbing that protective area of round cell infiltration thrown out about the focus of infection. Our septic cases were placed out of doors and in the Fowler position. Their feeding was forced as much as possible. Some cases received repeated blood transfusions of small quantities of blood at a time, some received salvarsan intravenously, others were treated by vaccines and sera. This type of treatment is a matter upon which the attendant's personal opinion may rightly vary, but we can see no reason for variation of opinion from the conservative and the radical viewpoints. We have thus far noted no special difference in ultimate result or in the duration of illness in the septic cases relative to any special type of extrauterine treatment.

A statistical study of this series follows:

| | | |
|---|---|---|
| Patients treated | | 530 |
| Cured or improved | | 517 |
| Died | | 13 |
| *Mortality* | | |
| Died of complicating diseases | | 6 |
| Bronchopneumonia | 2 | |
| Lobar pneumonia | 3 | |
| Pulmonary infarction | 1 | |
| Died of postabortal sepsis | | 7 |
| Curetted prior to admission | 4 | |
| Admitted induction of abortion | 1 | |
| Aseptic cases | | 440 |
| Septic cases (Patients were considered septic if their temperature became higher than 101° F.) | | 90 |
| Recovered | | 83 |
| Died | | 7 |

| | | |
|---|---|---|
| Average period of gestation of 530 cases | | 2 months |
| Average number of days of bleeding before entering hospital | | 11 |
| Patients admitting induction of abortion | | 37 |
| Methods of induction | | |
| By catheter (self-inserted or by midwife) | | 30 |
| By physician | | 4 |
| Elm stick | | 3 |
| Average number of days aseptic patients remained in hospital | | 7 |
| Average number of days septic patients remained in hospital | | 20 |
| Treatment | | 530 |
| Packing | 381 | |
| Packed once | 318 | |
| Required repacking | 81 | |
| No packing required | 131 | |
| Curettage | | 18 |
| Average number of days in hospital after curettage | | 9 |
| Temperature of these patients was irregularly intermittent, not going higher than 100° in 14 cases and reaching 101° or above in 4 cases | | |
| Cases readmitted because of bleeding | | 3 |
| Curetted after readmission | | 2 |

*Follow-up Work on 100 Consecutive Conservatively Treated Cases*

(From this series of 530 cases)

| | |
|---|---|
| 100 patients were visited by a Social Service worker and examined by a member of Bellevue House staff after patient's discharge from the hospital. | |
| Discharged, up and about, without bleeding | 81 |
| Discharged, with slight bleeding and pessary | 19 |
| When visited at a period of not less than two weeks after discharge | |
| No bleeding | 80 |
| Slight bleeding (menstrual type) | 17 |
| Profuse bleeding (more than menstrual) | 3 |

It seems permissible to draw the following conclusions from these data:

1. All cases of abortion, threatened, inevitable or incomplete should be treated conservatively until it is demonstrated that conservative treatment has failed.

2. Conservative treatment, properly executed, will fail in something less than four cases out of one hundred.

3. The mortality and morbidity in abortion cases is in direct ratio with the degree of intrauterine interference. The more the manipulation and interference, the higher the mortality and morbidity.

4. Curettage in abortion transposes many aseptic cases into septic cases.

5. Curettage, therefore, is not only seldom indicated, but is often actually harmful.

6. Conservative treatment has, if possible, a more positive indication in septic than aseptic cases.

71 HALSEY STREET.

(*For discussion, see p. 569.*)

# Society Transactions

## AMERICAN GYNECOLOGICAL SOCIETY. FORTY-SIXTH ANNUAL MEETING HELD IN SWAMPSCOTT, MASS., JUNE 2, 3, AND 4, 1921

*(Continued from October issue)*

DR. FREDERICK TAUSSIG, of St. Louis, presented a paper on **Development of the Hymen.** (For original paper see page 471.)

### DISCUSSION

DR. W. BLAIR BELL, LIVERPOOL, ENGLAND (by invitation).—The problem, as it presents itself to me, resolves itself into two divisions, namely, is the hymen a new formation, or is it the remnants of a disappearing structure? Dr. Taussig says it is a new formation. I presume that he means that it is an overgrowth of connective tissue produced when the labia are developed at the roof of the external cloaca. It is impossible to discuss this subject properly without going into a good deal of comparative anatomy, not only of the internal but also of the external cloaca. This I cannot do now.

Dr. Taussig refers to the prominence of the hymen in the higher apes and in the human subject, but I differ from him when he says that this structure does not exist in the lower animals. It does, but it is not apparent because the urogenital sinus in the lower orders of mammals is long, and the hymen is at the top, at the junction of the urogenital sinus and vagina. The hymen is well developed in such an animal as the horse, but because it is situated high up it cannot readily be recognized.

Dr. Taussig referred to the papers I have written in connection with abnormalities in this region. I think I have myself shown definitely that the so-called hymenal occlusion is nothing of the sort. It is an occlusion of the lower end of the vagina, and in 60 per cent of cases almost invariably the lining membrane on the inside of these occlusions is columnar in part or entirety. One finds, in fact, a number of specimens in which there is columnar epithelium on the inside and squamous epithelium on the outside. It is interesting, too, that there can be found on the occluding membrane traces of the hymen, and in these remnants squamous epithelium is seen on both sides. Absence of the hymen is rare, and when it does occur it is my belief that there has been total instead of partial disappearance.

I am at present of the opinion that the hymen represents the remains of what we call the urogenital plate, that is to say, the anterior portion of the original cloacal membrane, which becomes divided by the urorectal septum into two parts. It is important to remember that whereas the vagina comes down from above and leads to central or partial disappearance of the urogenital membrane, the rear part of the cloacal membrane, which covers the site of the anus, is depressed upwards (or inwards) to meet the hind gut; consequently in the former a remnant is left, while no trace of the posterior part of the cloacal membrane in the region of the anus is apparent.

It is a very important matter that there are so many varieties of hymens. A

cribriform hymen is what might be expected in a disappearing structure, not in a structure newly-formed in every case.

These are just arguments I present against Dr. Taussig's thesis to make the matter more interesting, for, as I have said, I cannot at present absolutely decide that the hymen is the remnant of the disappearing urogenital membrane as opposed to the view that it is a new formation.

DR. TAUSSIG (closing).—I am sure there is neither time nor would the members be especially interested in the pros and cons of the theories regarding the development of the hymen. In the time allotted I was able to present only a portion of the evidence obtained from the study of the serial sections in my twenty embryos. Certainly this evidence points strongly in favor of the development of the hymen as an actively proliferating connective tissue process rather than an obliteration membrane, either cloacal or vulvovaginal.

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DR. JOHN A. SAMPSON, of Albany, New York, read a paper entitled, **Perforating Hemorrhagic (Chocolate) Cysts of the Ovary,*** calling attention to their importance and especially their relation to pelvic adenomata of endometrial type, (adenomyoma of the uterus, rectovaginal septum, sigmoid, etc.) The following is the author's abstract:

Perforating hemorrhagic cysts of the ovary occur most frequently in women between thirty years of age and the menopause. In the twenty-three cases reported in this paper only two were under thirty and I have never found one in a woman after the menopause. It is quite a common condition, probably occurring in nearly 10 per cent of the women of the above age limits who require abdominal operations for the relief of pelvic disease. During the year May 1, 1920, to May 1, 1921, I found perforating hemorrhagic cysts of the ovary in fourteen of one hundred and seventy-eight patients between thirty and fifty years of age who had an abdominal operation for some disease of the pelvic organs.

The cysts are usually small, between two and four centimeters in diameter, occasionally less than two and also occasionally larger than four centimeters. They are quite frequently bilateral, as in eight of the twenty-three cases.

At operation the cyst or ovary is found to be adherent and in freeing it the "chocolate" contents escape because a previous perforation, which had been sealed by whatever structure the ovary had become adherent to, is reopened. Adhesions, due to the "irritating" action of the material which had previously escaped from the ovary, are always present and these vary greatly in location, density and extent. They may be found in any of the natural pockets and folds of the pelvis where such material would be apt to lodge and especially in the culdesac. When slight they simulate the adhesions resulting from pelvic peritonitis of tubal origin, on the other hand the adhesions in the culdesac may be accompanied by such a marked reaction as to resemble malignancy.

The histologic findings in these cysts vary in different specimens and in different portions of the same cyst. In discussing their life history I prefer to state "possibilities" at the present time, reserving a fuller presentation of the subject until I have had the opportunity to study more material. There may be several varieties of cysts but I am more inclined to believe that the apparently different kinds represent various stages in the development and retrogression of one type of cyst and

*From the Gynecological and Pathological Departments of the Albany Hospital and the Albany Medical College.

also various phases of its menstrual cycle. The initial perforation may have been the rupture of an "endometrial" graafian follicle or atretic follicle hematoma; or following ovulation an abnormal corpus luteum may have developed, due to the invasion of "endometrial tissue" present at the site of rupture. One group of these perforating hemorrhagic cysts shows the following conditions; a portion of the hematoma, usually the deeper, is lined by a "luteal" membrane the exact origin of which I have been unable to determine in every case. The rest of the cyst, usually towards the perforation, is apparently being relined by the invasion of epithelium, through the perforation, from epithelium situated in the periphery of the ovary at the site of rupture. This epithelial relining or regeneration is of endometrial type both in structure and in function. With the advance of the epithelial invasion the "luteal" membrane retrogresses and eventually the entire cyst may be relined by this epithelial tissue. This group represents either the development of an endometrial cyst from the invasion of a follicular hematoma by misplaced "endometrial" epithelium or else it *represents the regeneration of an "endometrial" cyst after a hemorrhage (menstrual)*. Another group apparently represents either an earlier or a later stage of the former. The cysts in this group are entirely lined by epithelium, low, cuboidal or columnar; all three types of epithelium are often present in the same cyst. Usually there is a vascular cellular stroma not unlike that of the endometrium, between the epithelium and the ovarian tissue. This stroma varies greatly in thickness and in some instances may be very thin or even lacking in places; structures, like uterine glands, may be present in this stroma and these are usually most numerous near the site of the perforation. The entire cyst is like the epithelial portion of the cysts described in the first group and all gradations between the two groups may be found.

The exact counterpart of the epithelial lining of these ovarian hematomata may be found in the uterine hematomata often occurring in adenomyoma of the uterus and apparently due to the retention of menstrual blood. Tissue of "endometrial" type is also present in pockets in the periphery of the ovary about the perforation and the tissue in these pockets may resemble normal endometrium more closely than that lining the meatoma in the same ovary. The histologic study of these hematomata shows that periodic hemorrhage occurs similar to that of menstruation. I have come to the conclusion that these ovarian hematomata are of endometrial type just as are the uterine hematomata found in adenomyoma of the uterus.

I have never found these cysts in women after the menopause and some that I have found were small and apparently retrogressing rapidly. In two instances where I found adhesions with adenoma of endometrial type in the pelvis, but no gross evidence of these cysts in the ovaries, pockets were found in the periphery of the ovaries lined by columnar cells and a cellular stroma resembling endometrial tissue. I interpreted these pockets as the possible remains of a perforating hemorrhagic cyst in which nearly complete retrogression had occurred. For the above reasons I have concluded that their life cycle may sometimes be of "short" duration and the "characteristic" adhesions resulting from them may persist long after the cyst has disappeared.

The adhesions form equally as interesting a pathologic study as the cysts themselves because adenoma of endometrial type is present in the tissues involved by the adhesions in a large percentage of the cases. I have studied histologically the tissues involved by the adhesions outside of the ovary in fourteen of the twenty-three specimens and *adenoma of endometrial type was found in thirteen.*

Sometime, or possibly many times, in the life cycle of these hematomata, material including epithelial tissue and blood ("menstrual") may escape into the peritoneal cavity from the hemorrhagic cyst or from the "endometrial" pockets in the ovary about the site of perforation and, lodging in the natural pockets and peritoneal

folds of the pelvis, causes adhesions. Adenoma of endometrial type often develops between the adherent folds of peritoneum thus resulting. These adenomata may be small, and quiescent or they may be invasive. *If invasive they may cause "adenomyoma" of the uterus by invasion of the uterine wall from "without" or "adenomyoma" of the utero sacral ligament, round ligament, recto vaginal septum, rectum, sigmoid, etc., namely, whatever structure or organ is invaded by the adenoma arising from the "infective" contents of the cyst or ovary lodging on its surface.* The question naturally arises, in what way does the content of the cyst or ovary cause the development of these adenomata? Is it due to some "specific" irritant present in the cyst contents which stimulates the peritoneal "endothelium;" thus causing a metaplasia and the development of endometrial tissue typical both in structure and in function? Some may claim that dormant "endometrial" epithelium may be present in the tissues soiled by the contents of the cyst and this is stimulated to further growth. *It seems to me that the condition found in many of these specimens is analogous to the implantation of ovarian papilloma or cancer on the peritoneal surface of the pelvis from the rupture of an ovarian tumor containing these growths.*

I offer the following as evidence that perforating hemorrhagic cysts of the ovary are hematomata of endometrial type:

1. These hematomata, as the uterine mucosa, manifest their "activity" during the menstrual life of the patient.

2. Histologically the epithelial lining of the ovarian hematomata is similar to that of the uterine hematomata, due to the retention of "menstrual" blood, often present in adenomyoma of the uterus.

3. Periodic hemorrhages occur in the ovarian hematomata which are similar in gross and histological appearance to that of menstruating endometrium.

4. The "chocolate" contents of the ovarian hematomata resemble old menstrual blood.

5. In two patients operated upon at the time of the menstrual period, one the day that menstruation was due and the other the last day of menstruation, the histological changes in the ovarian "endometrial" tissue corresponded to the phase of the menstrual cycle indicated by the menstrual history of the patient.

6. The fact that material escaping from the ovarian hematomata may give rise to the development of adenoma of endometrial type in the tissues thus soiled is further proof that these hematomata contain endometrial tissue.

I cannot state that these ovarian hematomata of endometrial type are the only cause of ectopic pelvic adenomata.

These ovarian hematomata with their secondary peritoneal "implantations" are a pathologic entity as definite as that of ovarian papilloma and cancer. They are likewise a definite clinical entity which is capable of diagnosis before operation in a large percentage of the cases.

## DISCUSSION

DR. RICHARD R. SMITH, GRAND RAPIDS, MICHIGAN.—I cannot discuss Dr. Sampson's paper from the standpoint of a pathologist, but must do so simply from that of a clinician.

I became interested in this class of cases about a year ago, at which time I made a study of hemorrhages occurring in the pelvic cavity exclusive of those resulting from ectopic pregnancy. Exclusive of tubes, the seat of pregnancy, the most constant source of hemorrhages in the pelvic cavity is the ovary, first, those occurring from normal graafian follicles, and second, those occurring in ovarian tumors the subject of traumatism or twisting, and third, an interesting group which has troubled us all as to etiology and has masqueraded under the head of hematoma ovarii. We have all met this condition frequently and have been puzzled by it.

It is commonly associated with some other pathologic condition of the pelvis, principally myomata.

Dr. Williams in discussing my paper last year before the Society stated that a special study should be made of these cases, since we have, as clinicians, recognized the fact that they form a definite clinical group. It has remained for Dr. Sampson to clear this matter up, and I am sure that gynecologists are grateful to him for having done so. We shall now recognize them as a definite, clinical, pathologic entity, and we shall approach the clinical side of the subject with new interest.

Just how we are to formulate our operative procedures, just what the indications are going to be in dealing with this condition, I think it is a little early to say, but we must bear in mind two things, one of which is, that we are dealing with a neoplastic disease, a disease which is capable of recurrence and further progress, and which may have within it serious future consequences to the patient. In the second place, we are dealing with a disease which apparently shows signs in its life history of retrogression; that is, the process may regress and disappear. Tentatively, I may suggest that we regard them as follows: we must consider those cases complicated by myomata as serious and deal with them radically. In others a more conservative course might well be followed.

DR. N. SPROAT HEANEY, CHICAGO.—I have wondered at the strength of the adhesions binding the ovary to the neighboring structures. Dr. Webster, in his study of ectopic pregnancy, advanced the theory that the pregnancy can only occur in tissue capable of undergoing decidual reaction. Therefore, for many years he doubted the occurrence of true ovarian pregnancy. Later he had two undoubted cases of ovarian pregnancy and then admitted their possibility, but could not correlate his decidual reaction theory with their occurrence. Dr. Sampson has found endometrial-like tissue in the ovary which after all proves Dr. Webster's decidual reaction true. Dr. Sampson has undoubtedly satisfied himself regarding one point concerning which I should like to inquire, namely, whether the endometrial tissue in the ovary is primary and the adenoma in the uterus is secondary to rupture of the cyst, or whether the ovary becomes infected by the endometrial tissue because it becomes adherent to the surface of the adenomyoma. I do not quite understand why the first possibility was accepted and why the second was ruled out of consideration.

DR. EDWARD H. RICHARDSON, BALTIMORE, MARYLAND.—I have seen a few of these cases myself, and certainly it is most satisfactory to have had this convincing proof brought forward as to the origin of these cases of adenoma of the rectovaginal septum and in other scattered tissues of the pelvis. It is remarkable and surprising to me to learn of the frequency of endometrial tissue in the ovary, and in view of this fact I must confess that I am puzzled to know how best to deal with this condition clinically, not only because it occurs apparently in the period of maximum fertility, but also from Dr. Sampson's contribution I got the impression that it very commonly is bilateral. All of us who have had to deal with adenomyoma of the rectovaginal septum know what a serious matter it is. If you have had the opportunity to observe any of these cases to the end, you know that this tumor is essentially a malignant one. It will invade the adjacent pelvic structures in very much the same way as carcinoma, and if you attempt, as I have done in one instance, to remove that tissue from the rectovaginal septum, either by the abdominal or vaginal route, you will find yourself face to face with a most serious and radical operation. I do believe in most instances it cannot be successfully removed unless you are willing to face a procedure of the first magnitude, and even then, in the light of this contribution, you would probably have a recurrence unless you also remove the ovaries. Since I have been reliably informed that radium

is ineffective in the treatment of adenomyoma, from our present viewpoint it looks as if one has to choose between hopelessly advancing growth and the removal of both ovaries during the child-bearing period in a condition which is by no means rare.

DR. RALPH H. POMEROY, BROOKLYN, NEW YORK.—As an incidental contribution to this discussion, I want to call attention to the history of a case that is now four years old. I had occasion to do a cesarean section on a young woman for a dermoid in the pelvis which was associated with a breech presentation. After the removal of the dermoid tumor, with a successful cesarean section, closing the incision in the ordinary way, a year following the patient came back complaining bitterly of pain in the abdominal wound, which was aggravated at the time of menstruation. I observed her through the menstrual periods and found a definite mass in the middle of the abdominal wound which between menstruation would subside, but it remained as a hard nodule. I insisted on operation, but she objected for six months. Finally I got her to consent to an operation. I told her I would not take out the uterus or sterilize her. I excised the abdominal scar, including the mass and a wedge from the top of the uterus, which was densely adherent to the abdominal wall. The tissue removed was submitted to a pathologist for examination, who reported adenomyoma. The woman has had no symptoms since and reports herself well. I thought I would add this case to the peculiar histories of hemorrhagic problems associated with adenomyoma in the menstruating woman.

DR. HUTCHINS.—I would like to ask whether these tumors can be diagnosed previous to operation fairly successfully by the character of the menstrual pain when it occurs and the time it occurs?

Dr. G. BROWN MILLER, WASHINGTON, D. C.—Since Dr. Cullen called attention to adenomyoma of the rectovaginal septum, I have had four cases. In two of these there were tumors in the sigmoid as large as those described by Dr. Sampson. One was operated on by Dr. Cullen, and I do not know whether he examined the tissue from the tumor surrounding the sigmoid or not. The case I operated on proved fatal. We could not get an autopsy, and the tissue surrounding the sigmoid was not removed, so that we do not know the nature of the growth.

I think Dr. Sampson's contribution is a most valuable one. The only difficult part to understand is in the cases where there was a tumor of the sigmoid, was that the tumor was not in contact with the adenomyoma of the rectovaginal septum or the ovaries. There were no adhesions of the bowel to the growth or to the ovary, and it would seem highly improbable that with the sigmoid separated so far from the chocolate cyst, it would lead by implantation to a well developed tumor of the bowel.

A case I have recently seen, answers Dr. Hutchins' question as to the symptoms in cases of adenomyoma of the rectovaginal septum. A woman complained of intense and persistent pain during the menstrual period, which would gradually subside and disappear ten days after the menstrual period had ceased. At the same time, she had definite symptoms of partial obstruction of the lower bowel. Evidently to my mind the tissue in the rectovaginal septum during menstruation caused pressure on the rectum to such an extent as to produce temporary partial obstruction of the bowel. As the menstrual period subsided, so the bowel symptoms subsided. It suggested a line of treatment that would give relief. The most difficult cases I have ever tried to operate on have been the two cases of this nature. The method of treatment which suggested itself was to sterilize the woman by the x-ray or radium. The last case I had had no pain except at the menstrual period, evidently due to the tissue which took part in menstruation, and if we prevent menstruation (in view of the great risk of removing the growth) I believe it would be the logical method of treating these cases. Dr. Cullen, however, to whom I wrote

concerning this case, said he had had two cases in which the ovaries had been removed along with the uterus, and in which the growth in the rectovaginal septum had subsequently progressed, causing another operation.

DR. JOSEPH L. BAER, CHICAGO, ILLINOIS.—Dr. Sampson showed us hemorrhagic cysts that are adjacent to tissue in which we are accustomed to find adenomyoma of the uterus or rectovaginal septum. I should be glad to know whether the doctor has met with cases in which perforating ovarian cysts are in contact with tissue remote from the uterus or rectovaginal septum, and whether he has found any such adenomyoma in such remote tissue.

DR. CAREY CULBERTSON, CHICAGO.—Dr Sampson's demonstration would appear to clear up in a measure the difference of opinion found to exist in the literature relative to the origin of this type of tumor. Since Lockyer's first report of a tumor of this nature and that of Stevens' six cases in 1915, these tumors have been accepted as neoplasms, but in the German literature we find similar growths described as products of inflammatory reaction. Bartkiewitsch regarded them as muscle hyperplasias and used the term "adenomyometritis;" Amann used the term "retrocervical fibroadenomatous serositis," and Myer "adenomyositis uteri et recti." Stevens and Cullen have insisted that these tumors are true neoplasms, though usually bound up with extensive and dense adhesions, and it is this latter condition which is now explained so ably by Dr. Sampson, together with what would appear to be proof that these growths are true neoplasms. We now see that certain ovarian cysts may contain tissue identical in type with that of the mucosa of the uterine body, that such a cyst may spill its contents into the pouch of Douglas and give rise not only to proliferation of the adenomatous structure but to the formation of dense adhesions.

DR. WALTER WILLIAM CHIPMAN, MONTREAL, CANADA.—When Dr. Sampson refers to endometrial tissue in the ovary, he uses that merely as a descriptive term. He does not mean the endometrium is in the ovary because genetically the two tissues of the müllerian tract and ovary are different.

I would like to ask another question. Would not the cellular spill from such a cyst thrown down into the pouch provide for the epithelium which we find in these glandular acini and the fibrous and muscle tissue by the reaction from this secretion?

DR. SAMPSON, (closing).—In answer to the questions which have been asked, I believe the growth is primary in the ovary, and not in the adenomyoma, and that the extension is from the ovary to the uterus and not from the uterus to the ovary. Cases have been reported in which adenomyoma was adherent to the ovary and the adenomyoma invaded the ovary. I think these cases might also admit of a reverse interpretation. In several of my cases the perforating hemorrhagic cyst of the ovary was not in contact with the growth in the culdesac, and I have some slides in which there were many adenomatous growths in the pelvis. The contents of the ovary had apparently escaped into the pelvis, and the adenomatous growth was found in the vesicouterine reflection of the peritoneum, around the round ligament, between the tubes and the ovarian ligament, and also in the culdesac, i.e., in any pocket in which such material would likely fall. Just exactly as in papilloma of the ovary these pockets may contain papillary implantations.

The question has also been asked, are all cases of adenomyoma of the rectovaginal septum and other ectopic adenomyomata, associated with perforating hemorrhagic cyst of the ovary? I cannot answer this question. The literature on the subject is not of very much value in determining this point, because the men who have reported ectopic adenomyomata were apparently more interested in the adenomatous growth than they were in the condition of the ovaries. In my own ex-

perience all the definite cases of ectopic adenomyomata were associated with these cysts. I have had two cases in which there were small nodules in the culdesac which I excised, and histologically it was difficult for me to determine definitely whether they were adenomyomata of endometrial type. I thought they might be. I examined the ovaries in these two cases, but could not find any gross evidence of these cysts. Hysterectomy was necessary in both cases, and the uterus was removed together with the ovaries. In each instance on examining the ovaries microscopically spaces were found lined by columnar epithelium and stroma resembling endometrium which might have been these cysts that had almost completely retrogressed. I believe these ovarian hematomata passed through a process of development, followed by one of retrogression, so that the smaller ones might almost entirely disappear. I do not wish to speak more about this phase of the subject because my views are not definitely formulated, and I am afraid I might say something which may not be true, even though I believe them at the present time; I wish to reserve such remarks until I know more about the subject.

I think it is possible that we may find ectopic adenomyoma without any gross evidence of these cysts, and yet they may come from these cysts primarily or from pockets in the ovary containing tissue of endometrial type. In other words, ectopic adenomyoma may persist long after the cysts or ovarian condition has disappeared.

Dr. Hutchins asked about making the diagnosis from the history and from the physical signs. Dr. Richardson and Dr. Miller have spoken about advanced cases. The latter are the exception. The less extensive cases are much more common. The history varies greatly. In the moderately advanced cases pain is often present, but there is nothing characteristic about the pain unless there is involvement of some such structure as the rectum, as brought out by Dr. Miller. I think, however, acquired dysmenorrhea of short duration and of the progressive type is a fairly common symptom.

In regard to the physical signs, the advanced cases resemble malignancy. In moderately advanced cases, it is possible to make a diagnosis. In the cases I reported tonight, 23 in number, I believe it was possible to have made a diagnosis before operation in one-half of them, but I did not do so. However, in the last year, I have made a diagnosis in about half of them before operation. We are able to make a diagnosis of a malignant ovarian cyst from the following physical signs; the ovarian cyst is adherent and we may also find involvement or implantations in the culdesac. If we find those two signs, I believe we are dealing with a malignant ovarian cyst. In the condition under discussion, we find an adherent ovary which feels like an adherent cystic ovary or a hydrosalpinx. In addition to that, we may feel a localized induration in the culdesac which is often nodular and does not resemble the conditions resulting from chronic pelvic inflammatory disease. When we find this combination of physical signs in a woman between thirty years of age and the menopause (often coupled with a retroflexion of the uterus) we can make a pretty reasonable diagnosis of this condition.

Its treatment is still in the experimental stage. I cannot help but think, from my own experience, that ovarian conservatism is a rather dangerous experiment. Of three cases, I operated on over a year ago in which I removed one ovary, I have operated on one since and two I have examined lately. In one of the latter I could feel an adherent enlarged ovary on one side and induration in the culdesac between the rectum and the uterus. I believe that the remaining ovary has caused a continuation of the growth already in the culdesac, or possibly in freeing the ovarian hematoma removed at the time of the operation I was responsible for causing the escape of the contents of the cyst and its subsequent growth in the culdesac. The other case showed a somewhat similar condition, but not so marked.

Dr. Culbertson brought out a very interesting point. There has been considerable written on the so-called inflammatory origin of adenomyoma in which is advocated a

belief that adenomyoma may arise from the irritation of the peritoneum so that the endothelium is converted into tissue which is histologically similar to endometrium, and not only that, but may function as such. These writers would consider the work which I have done as confirmatory of their views. It seems to me that it is more analogous to the implantation which occurs from a ruptured ovarian cyst containing papilloma or cancer than a metaplasia of the endothelium of the peritoneum arising from some specific irritant in the contents of this hematoma.

Dr. Chipman spoke about endometrial tissue in the ovary. I prefer to speak of it as tissue of endometrial type.

DR. CHIPMAN.—My question was, would not the cellular spill from such a cyst thrown down into the pouch provide for the epithelium which we find in these glandular acini and fibrous and muscle tissues, by the reaction from this secretion?

DR. SAMPSON.—I believe it would. The spill of the cyst carries with it the epithelium which lines it or is situated in the periphery of the ovary at the site of perforation. This epithelium we find in may instances invades the surrounding tissue without reaction on the part of the tissue, and when a reaction takes place, it is not that of a true inflammation, but a hypertrophy of the muscle and of the connective tissue just as we find in an ordinary myoma. It is an extension of this epithelium from the peritoneal surface of the uterus into the uterine wall. I showed in one section in which the growth had invaded the uterine wall that there was no characteristic uterine stroma about it near the surface, but as it extended deeper the characteristic uterine stroma developed around the invading adenomyoma suggesting that the stroma in this instance was derived from the tissue which was invaded and not carried by the growth. I think in some instances pieces of tissue containing both glands and stroma may become deposited in the culdesac and there develop, as I expect to show in another communication.

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DR. ARTHUR CURTIS, of Chicago, read a paper on **Bacteriology and Pathology of Fallopian Tubes Removed at Operation.** (The following is the author's abstract.)

This study indicates that gonorrheal infection is responsible for at least three-fourths of all inflammatory lesions of the fallopian tubes. Infection with various types of streptococci has been second in frequency. Tuberculosis, exclusive of generalized tuberculous peritonitis, ranks third. Infections with other bacteria, notably those of the colon group, have been less common and less important. With the exception of a few streptococcus infections, bacteria have not been isolated from tubes which fail to show grossly active inflammation. Just as gonorrheal endometritis seldom becomes chronic, so it appears that gonorrheal infection of the tubes runs a quickly self-limited course. While it has long been known that gonococci soon disappear from the tubal mucosa, it is of interest to learn that modern cultural methods fail to yield growth when the entire diseased tube is thoroughly ground and inoculated into culture media, provided two weeks have elapsed since temperature and leucocyte count returned to normal. This test has been performed repeatedly and with unvarying results. We therefore feel warranted in the conclusion that the fallopian tube is not a focus for chronic gonorrheal infection. Unfortunately this does not exclude the danger of repeated infection from without, or recurrent invasion of bacteria from the chronically infected lower genital tract.

The present study sustains previous experience that the colon bacillus does not cause serious tubal disease. Bacillus coli is particularly frequent in tuboovarian abscess of large size. As a primary cause of salpingitis it appears to be of little

importance. A survey of the pathology encountered in these tubes emphasizes that gonorrheal infection primarily involves the tubes, with resultant thickening, nodulation, closure of the fimbriated ends, and pelvic adhesions which are amenable to separation by blunt dissection.

In streptococcus infection tubal involvement is usually but a part of the picture. Perisalpingitis is the most frequent type of tubal lesion, although typical salpingitis, notably hydrosalpinx, occurs with moderate frequency.

Tuberculosis is very likely to be overlooked if routine histologic preparations are not made. When limited to the pelvic organs it is difficult to establish a diagnosis from the gross appearance alone. Unusually resistant adhesions suggest tuberculous or streptococcus infection.

Somewhat similar operative measures appear indicated in streptococcus and in tuberculous salpingitis. In both diseases infection is not usually confined to the tubes; in both, viable bacteria are often still present in the tissues and there is danger of chronic postoperative infection of the ovaries. It is not my desire to suggest definite rules for operative procedure, but with the possible exception of the cervix, and particularly in regard to extirpation of the ovaries, more radical surgery appears indicated than in gonorrheal infections of corresponding severity.

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Dr. William A. Scott, of Toronto, Canada, read by invitation, a paper on **Hemorrhage from the Nonpregnant Uterus in the Absence of a Neoplasm.** (For original article see page 479.)

DISCUSSION

DR. JOHN A. SAMPSON, Albany, New York.—I think Dr. Scott's paper is a valuable contribution in showing that there is no constant histologic change to account for such bleeding. We appreciate that bleeding from the uterine cavity, in the absence of a new growth, indicates, in the first place, some injury to the endometrium, and second, that the musculature of the uterus is not sufficiently contracted to shut off the venous channels which convey the blood from the venous endometrial plexus to the deeper plexus in the uterine wall. That is very well brought out in connection with curettement of the uterus. When we curette the uterus we remove endometrium, and while there is relaxation there is profuse hemorrhage from the cervix. Afterwards, even though the endometrium is still removed, provided the uterus is contracted, bleeding does not occur, so that I think we must look upon many of these cases of uterine bleeding, whatever the cause may be as due to something which prevents in some way the normal contractility of the uterus by which it can properly control its venous circulation. As long as the uterus contracts, it is impossible for the venous blood to escape into the uterine cavity, and it is venous blood that escapes.

DR. WILLIAM S. STONE, New York City.—I have studied this condition carefully in the laboratory, and I can confirm the statement Dr. Sampson has just made. The only condition in the uterus that seems to be at all constant is the relative disproportion of the muscle and fibrous connective tissue. That was not altogether constant, but the most constant histologic feature I was able to determine. I have always thought the muscle insufficiency as it is developed more or less accounted for the bleeding, and it accounts for the bleeding also in those rather infrequent cases in young women as well as in the older.

DR. CAREY CULBERTSON, Chicago.—From the abstract of Dr. Scott's paper given in the program, I infer that he regards the origin of this hemorrhage as probably ovarian. There is much evidence that the bleeding is due to ovarian dys-

function, whatever that means, but I firmly agree with Dr. Sampson that flaccidity of the uterine wall, which he brought out so well in his work on fibroids, is largely accountable for the hemorrhage. Whether this lack of tone is present when these organs bleed, hence due to organic fault, or whether a functional disturbance of the ovary exists unfortunately cannot be demonstrated by section of the post-mortem tissues. The whole subject brings up the treatment, which today is provided for in a variety of ways. Should the uterus be taken out since we have radium? These hemorrhages have been stopped temporarily by radium. Many of these menstrual disturbances can be corrected very nicely by endocrine treatment. I have given extract of the whole pituitary body in two grain doses in some of these cases where the uterus seemed to be clinically normal, with very satisfactory results.

DR. SCOTT, (closing).—I can only bring out the one iconoclastic point which is my opinion, namely, that none of the local histologic findings in the uterus can be taken as the ultimate cause of this type of bleeding. It is my own opinion that the cause of the bleeding is endocrine, likely ovarian, and I quite agree with what the last speaker (Dr. Culbertson) said, that more and more we are going to get away from surgery in the treatment of these cases. A few of them respond to endocrine treatment, but that must be regarded as more or less empiric. The use of whole pituitary body is sometimes successful, so is sometimes the administration of thyroid, but one can with absolute assurance guarantee the patient a cure in these cases by the proper use of either radium or x-ray, and it makes no difference which is used. One can get just as successful results from the use of one of these agents as from the other. Of course we must eliminate the possibility of neoplasm in the body of the uterus. In the last year and a half in the service with which I am connected, we have treated nearly all these cases by the use of the x-ray as we did not have sufficient radium at that time.

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DR. THOMAS J. WATKINS, of Chicago, read a paper on **Ovulation and Menstruation as Postoperative Considerations.** (For original article see page 489.)

DR. FREDERICK C. HOLDEN, of New York, read a paper entitled **Radical Conservatism in the Operative Treatment of Chronic Adnexal Disease.** (For original article see page 493.)

DR. CAREY CULBERTSON, of Chicago, read by invitation, a paper entitled **The Disposition of the Uterus Following Salpingectomy Where It Is Desirable to Preserve Menstruation.** (For original article see page 497.)

### DISCUSSION ON THE PAPERS OF DRS. WATKINS, HOLDEN, AND CULBERTSON

DR. WILLIAM P. GRAVES, BOSTON, MASSACHUSETTS.—Dr. Watkins' excellent paper brings up the consideration of the matured ovary in its rôle as an apparatus for reproduction and in contrast to the other glands of internal secretion, even including the testicle, its comparative lack of importance to the general organisms of the women.

I should like also to discuss the very important question of the relationship between ovulation and menstruation, and to show the necessity for harmony between these two functions. I should like to show, for example, the danger to

a patient's nervous organization that may attend such disharmony as sometimes follows operations that allow for ovulation but prevent menstruation or when deficient activity in one or both functions is produced by mutilation of the pelvic organs. It would be interesting also to discuss the ovary as an organ of internal secretion from the standpoint of the specific tissue in which the secretion is probably elaborated, and the bearing which this has on the subject of ovarian therapy.

I shall confine myself, however, to one statement made by Dr. Watkins which, if I read it correctly, is to the effect that the writer has never noted the serious changes, such as adhesions and cystic degeneration that are claimed to occur in ovaries that have been left *in situ* after hysterectomy. In answer to this statement I have brought with me a few specimens, the histories of which I will recount.

The patient from whom one of these was taken is now in the hospital having been operated on about 10 days ago. I had intended to keep this case over until next week and invite Dr. Watkins to be present at the operation, but the symptoms were so severe that I could not wait. The patient was first operated on last September by a surgeon in a neighboring city. The operation was for a pelvic inflammation of gonorrheal origin. A hysterectomy was performed, the right ovary being left *in situ*. After the operation the patient had very severe hot flushes and troublesome molimena at the times of her regular periods. In the course of time the nervous manifestations at the time of the periods took the form of spasmodic muscular twitchings, and violent hiccoughs. Of late the spells of hiccoughs had not been confined to the times of the menstrual periods, and were becoming more and more frequent. Examination of the patient about a month ago revealed a young woman of 25, very pale, and hysterical. In the pelvis was a cystic ovary on the right about the size of a mandarin orange. The operation consisted of the removal of an extremely adherent cyst with involvement of the neighboring coils of intestine. The contents of the cyst were of the chocolate variety. Since the operation the patient has had no hiccoughs though previously she had had five or six spells daily. She has been entirely placid during the convalescence. Hot flushes have continued about as before.

In the second case, this cyst was taken from a woman, 27 years of age, who, two years previously had been operated on in New York for pelvic inflammation, hysterectomy having been done with the retention of one ovary. Soon after the operation she began to have dragging sensations in the right side, with occasional very acute attacks of pain. This went on for two years. She came to the Free Hospital for Women and was operated upon by my associate Dr. Pemberton. The cyst was removed, and the patient made a complete recovery.

It is quite interesting to see that there is a small corpus luteum on the surface of the cyst, bearing out Dr. Watkins' claim.

The next specimen consists of necrotic cancerous material. The patient was operated on at the Beverly Hospital. After the operation, on section of the uterus, it was found that there was a carcinoma of the fundus in connection with the fibroids. About a year after the operation, when I saw the patient she was bleeding from the cervical stump. At that time I supposed she was having a recurrence of the carcinoma in the cervical stump. On opening the abdomen I found the right ovary, which had been left *in situ*, a mass of cancerous tissue. This was scooped out by the hand. It was the material which I show you. This case illustrated one of the dangers in operating on fibroids. A considerable percentage of them are associated with adenocarcinoma of the endometrium. We all know that the first metastasis from carcinoma of the fundus is in the ovaries, and that it may occur early. If in operating on a large fibroid, one leaves in the ovary, it is important to cut the specimen open before closing the wound to make sure that there is no adenocarcinoma in the body of the uterus.

There is one other case I wish to report. A patient was operated at the

Massachusetts General Hospital for fibroids of the uterus. Six years later she came to the Free Hospital for Women with a large mass in the abdomen. Operation disclosed a large malignant papillary cystadenoma of the ovary on one side, and on the other a very small ovary in which there was a beginning process of the cystic adenomatous type.

The two second cases illustrate the necessity of care when one operates on fibroid tumors of the uterus, and leaves ovaries *in situ*. The first two cases illustrate the necessity of removing the ovary in cases of hysterectomy for pelvic inflammation. Such ovaries are practically sure to become adherent and cystic as in these two cases, and cause such symptoms as to necessitate an operation that is very much more difficult and dangerous than the original hysterectomy.

DR. EDWARD H. RICHARDSON, BALTIMORE, MARYLAND.—I have been able to settle the indications for conservation of the ovary in my own mind by conceiving the ovaries as having a two-fold function. It seems very clear that if one differentiates the function of the ovary as regards menstruation and reproduction on the one hand, and then the function of the ovary in its relation to the whole endocrine system on the other, he can get a thorough conception of the advisability of retaining ovaries when it is possible. We are all familiar with the strong chain of evidence which can be collected to show that entirely outside of that period of the woman's life associated with reproduction, that is, before puberty—and I am not at all convinced that it does not hold true also after the menopause—the ovary has a most important function in the body metabolism. Certainly it has before puberty. So far as I know, there is no evidence at present to prove conclusively that the ovary ceases to function after menstruation has ceased and after the child-bearing period. On the contrary, there is evidence to show there is functional activity in the ovary after the menopause. My own feeling about it is, unless one has a clear indication for removal of the ovary at the time of operation, regardless of the age of the woman, the ovary should be conserved.

The question of what happens to a conserved ovary is a complex one, and I am quite in accord with Dr. Graves in his opinion when, in inflammatory cases, where the ovary is adherent or where it is involved in inflammatory disease, and one can reasonably assume such an ovary will become adherent and undergo cystic degeneration, it had better be removed. But I certainly believe, so far as my observation goes, when one takes hospital statistics and hospital histories and undertakes to determine what percentage of conserved ovaries subsequently undergo cystic degeneration changes and require removal, he will find it difficult in most instances in reading a description of the operation and the condition of the ovary at the time of operation, to determine from the record what was done or what was the condition of the ovary. It is to be remembered that in a very important percentage, the circulation of the ovary is interfered with in the removal of the uterus. If you remove the tube, provided you are not careful to safeguard the anastomosis in the mesosalpinx between the arcuate vessels with the terminal uterine artery, in the removal of the uterus, you cut off the supply of blood which goes to the uterine artery. If you do not stick close to the tube and conserve the collateral circulation by the removal of the tube with the uterus, you cut off the circulation of one-third of the ovary in probably over one-half of the cases. It is not surprising therefore that subsequently such ovaries degenerate, and unless we have a record of not only the condition of the ovary as regards disease at the time of operation, but also have a specific note as to whether the operator improved the collateral circulation and safeguarded it in the removal of the ovaries, we will have a large percentage of degenerative changes in such ovaries. In my own personal experience I have never seen yet a case of subsequent cystic degeneration of the ovary requiring removal, where the ovary was sound at the time of operation and where the tube was conserved.

I feel strongly therefore that the important practical surgical point is to safeguard the circulation by retaining the tubes wherever possible, and I also feel the ovary should be conserved because at present we do not know that the ovary ceases to function in other important respects than that of menstruation and reproduction even after the menopause.

DR. W. BLAIR BELL, LIVERPOOL, ENGLAND (by invitation).—In the treatment of lesions associated with chronic infections in the pelvis, we have the opportunity of showing our faith in, and adherence to, the essential principles of surgery, namely, the removal or repair of diseased structures that are causing symptoms, and the conservation of function. These I hold to be the essential principles of surgery.

In regard, therefore, to the various operative procedures employed, I think we must always have these principles in mind. When we do, we find we cannot adopt one operation for every type of pelvic infection. We must adapt our procedures to the lesions present, and take into consideration the causal factors of these lesions.

My own surgical procedures are based on what I believe to be the causal factors of the disease and the lesions that have been produced thereby. If there has been, for instance, an appendicular infection which has sealed the abdominal ostium of a tube, there is no reason in a majority of cases to remove that tube. A salpingostomy is all that is necessary. The lining membrane is uninfected.

When we are dealing with tuberculosis we must take into consideration the way in which the infection has reached the pelvic organs. If there is a general infection of the peritoneum, one always finds, sooner or later, that if the tubes are not removed at the time the fluid is drained away, tuberculous pyosalpinges will be formed. Mayo indeed, has rightly insisted on removal of the tubes at the time the fluid is drained from the peritoneal cavity. In the more latent conditions without acute peritoneal infection it is necessary to remove the whole uterus, for I have seen descending infection start in the peritoneum, go through the tubes and not only involve the cervix, but also the vault of the vagina.

With regard to the more common gonorrheal infections, it is common knowledge that in a large proportion of cases the patient complains of menorrhagia. Associated with these may be a profuse leucorrheal discharge. If the infection be active in the cervix, it is important first to amputate the cervix. Afterwards, in treating a serious intrapelvic infection, I perform the operation which I described in 1913, and which has been mentioned by Dr. Culbertson. In that operation I aim to remove the diseased tubes, which are converted into pyosalpinges, and to remove the fundus of the uterus, because I have shown that on pathologic examination it is frequently found to be deeply infected. In removing the fundus of the uterus I remove the cause of the menorrhagia.

I need not go into the details of the operation which I have published and which many of you practice. I have performed it 125 times. I use it, as I have said, almost entirely for gonorrheal infections.

If I may say so, without having tried it, on general principles I cannot approve of Dr. Holden's operation. He is leaving behind diseased structures. If the case happens to be one of streptococcic infection, there may be trouble subsequently, for as Dr. A. H. Curtis has pointed out, these organisms may remain latent in the tubes for many years. It does not seem to me to be a rational operation, and I would prefer to remove completely badly diseased structures. There is no objection to removing a tube except for the fact, which has already been mentioned, that in removing the tubes which are usually adherent pyosalpinges, it is almost impossible to excise them in such a way as to preserve the blood supply of the ovary. I have given up leaving any ovarian tissue at all, in nearly all these cases. I remove both tubes, the ovaries and fundus of the uterus in one piece. I am not content, however, with that as a functional result. I therefore take a piece of ovary and graft it.

I have grafted ovarian tissue in over 100 cases. We have recently investigated these cases, and we find that we have obtained functional results in over 80 per cent of them. In many, both ovaries had been converted into abscess cavities, containing pus. Under such circumstances I have implanted pieces of the ovaries in the internal oblique muscle alongside a drainage tube, passed through a stabwound at some distance from the median line, yet never has one of these grafts come away, and many of the women are still menstruating.

The ovarian function is a very important one not only in its bearing on reproduction, but also because its secretion is a link between many of the ductless glands.

In my ovarian extirpation experiments, I found considerable changes in the pituitary and thyroid, and I do not believe it is possible to break a chain of such metabolic importance and leave the patient perfectly normal afterwards. By grafting ovarian tissue, we attempt to conserve the essential metabolic functions of the ovary.

DR. CURTIS.—In case an ovary or part of it is grafted, how long is the menstrual function preserved?

DR. BELL.—I now have cases that have continued to menstruate for five years. They have not yet stopped, hence I am not able to answer Dr. Curtis' question.

I hope and trust that it will not go out to England that there is a consensus of opinion among the members of the American Gynecological Society that the ovarian function is of no importance. We had a discussion on ovarian grafting in England not long ago when several gynecologists stated that this was unnecessary work, that the ovary was of no use to any woman. At the close of the discussion, a practitioner rose and said that he had been very much interested in the discussion, inasmuch as he happened to have patients who had been operated on by those who had stated that ovarian function is of no importance, and that these patients were now the bane of his life. (Laughter.)

I do want to emphasize the fact that the ovary is an organ of importance, but that it is unnecessary and unwise in many instances to leave an adherent and infected ovary in the pelvis for it is liable to become cystic and that it is better in such circumstances to remove it and to resort to ovarian grafting. The grafting must be done properly with careful technic.

DR. CHARLES C. NORRIS, PHILADELPHIA.—I believe that the practice of gynecology has been well standardized. The question of ovarian conservation, however, is one on which a considerable difference of opinion exists. Our aim and object, of course, is to cure patients, and I believe the only way to determine this question is to study the end-results in series of cases.

Dr. Clark and I prepared a paper that we were unable to place on the program today. This comprised a study of 232 cases of myomata of the uterus, in some of which the ovaries had been conserved, and others bilateral oophorectomy had been performed. In none of these cases had less than one year elapsed since operation. In other words, we endeavored to determine which set of patients were the most comfortable—those in whom ovarian conservation had been practiced, or those in whom the ovaries had been ablated. In one-third of myoma cases the adnexa are inflamed. A questionnaire was sent to these patients, and I may say, in passing, that this form of inquiry is not a very satisfactory method of determining this subject. There is no single symptom from which women suffer as the result of castration that cannot be simulated by other conditions, and it is only by studying each case individually, noting how soon after operation the symptoms come on, how severe they are, and particularly the type of patient in whom they are present, that one can determine definitely whether or not the symptoms are due to the castration or to some other condition. J. O. Polak, in one of his papers, has insisted that a healthy woman, one free from pain, is far less likely to be neurotic

and subject to the usual phenomena of the artificial menopause than is one who is suffering from some malady. That is undoubtedly a fact. If we can cure a patient of her pelvic symptoms, even if we must perform a double oophorectomy, this is wiser than to conserve an ovary that will subsequently cause trouble. That the ovary without the uterus is a functionating organ I feel sure is true. That the ovary is an unimportant organ I do not believe. The question, in large measure, sifts itself down to whether or not we can conserve the ovary, so that it will not give rise to subsequent trouble. Conserved ovaries may undergo cystic degeneration and cause dysparunia and various other symptoms.

I believe that in this more than in most operative procedures, surgical judgment is essential. We teach our students at the University of Pennsylvania that in ovarian conservation three essentials are requisite: In the first place, the ovary itself must be in fairly good condition. In other words, it must not be the seat of a disease that will develop after removal of the uterus. Graves has reported cases in which the ovary was the seat of carcinoma, perhaps metastatic in origin. We make it a rule that on removing the uterus it should be opened before the operation is over in order to determine whether or not carcinoma is present. If such is found bilateral salpingo-oophorectomy should be performed. If the ovary is severely diseased, that is, the seat of extensive cystic degeneration, etc., it is unwise to conserve it. It is far better to excise such an ovary than to attempt conservation. Secondly, successful conservation cannot be practiced if the blood supply is interfered with. Such interference will cause the ovary to become edematous and cystic. The third point to be remembered is that the ovary must be left in good position. Therefore, the matter again sifts itself down to the individual equation of the operator and his ability to judge of the condition of the ovary *in situ*. Furthermore, it is largely a question of further study of a series of ovaries in laboratories, in order to determine their condition, and then to correlate the findings with those found at operation, and more especially with the end-results. We know, as a fact, that we can remove ovaries and cure patients. The first question in our questionnaire was, "Have you pain as a result of your operation? Have you been improved or cured, or are you worse since the operation?" In our whole series of cases, and it may have been a particularly fortunate series, 99.5 per cent answered that they had been improved or cured regardless of whether or not the ovaries had been removed. About 20 per cent of our cases were examined by us subsequently, and in these cases the advantage of ovarian conservation was particularly striking. In our entire series, it has not been necessary subsequently to remove an ovary, a fact brought out also by Dr. Culbertson in his paper, read this morning, in which, in some 500 cases, no subsequent operation was necessary. If we operate along lines that will conserve the ovarian blood supply, if we leave the ovary in good position, if we exercise good surgical judgment, it is possible with myomata of the uterus to save a large percentage of ovaries. Our study shows very definitely that these cases were more comfortable subsequently and they did not suffer so severely from the effects of the artificial menopause as did those in whom both ovaries were removed.

Of 261 conserved ovaries, none of which have been operated on less than one year ago, and from that period up to thirteen years, not a single one of the ovaries conserved by us has required subsequent removal. This is a strong argument for ovarian conservation in properly selected cases.

The question of the atrophy which results from bilateral oophorectomy is important, since in many cases this will give rise to considerable trouble following operation. In our clinic we have adopted as a routine the rule that no plastic operations are to be performed for minor degrees of relaxation upon patients in whom a double oophorectomy is required. This is a rule that has been forced upon us as the result of experience.

The question of preserving the menstrual function is also an important one. I believe that there are many women in whom menstruation has a definite bearing upon their subsequent comfort.

DR. JOHN O. POLAK, BROOKLYN, NEW YORK.—The question of conservation of the ovary and that ovarian function is a definite necessity, is one I think we are all agreed upon with the exception of Dr. Graves. The other point is that we have to individualize in each case. For instance, our studies in removal of ovaries in relation to fibroids, and our studies of ablation in pus cases, are very different, and so are our follow-up results. In the first place, we find that a very large proportion of women with fibroids have hypertension, and that the removal of the ovary in these patients increases the hypertension, and while the internist tells us that this hypertension, is an essential hypertension, the patients are not able to bear it, and they are uncomfortable, so that we make a strong effort to conserve an ovary when we remove fibroid tumors of long standing and when we conserve the ovary I do what Dr. Richardson called attention to, to conserve the tube by a technic which I have already published.

In our first series of 300 cases followed up, there were 41 in which we had subsequently to remove the ovary because of symptoms or pathology produced. We then published 132 cases where we had done the radical procedure, and we almost felt that Dr. Graves was right, until these patients came back to us with more marked nervous symptoms and were physical wrecks.

In our last series, we are making every effort to conserve ovaries, and we have so far not had to remove a single ovary which had been retained. I believe that this is due to two facts, namely we are more careful in trying to individualize the particular case, and are more carefully studying the condition of the ovary after we have separated it from its bad associations in pus cases. We are conserving the tube wherever possible, and furthermore, we are doing, since 1912, what Dr. Bell has called attention to, i. e. a partial resection of the fundus of the uterus. If the ovarian circulation can be maintained, and the ovary is primarily anywhere near its healthly state, and is not allowed to drop into the culdesac and get into bad company again, the functional part of that ovary remains for the benefit of the economy.

DR. JOSEPH BRETTAUER, NEW YORK CITY.—I think Dr. Polak as usual has hit the nail on the head and in his concise way has expressed the opinion of nearly all of us. But the gist of this whole discussion and the contents of these papers make me believe more than ever that in inflammatory disease of the adnexa conservatism is more important than the decision to leave or to remove the ovary. When it is necessary to operate for inflammatory diseases, my experience has been that a patient is better off with both tubes and both ovaries out than in.

As to the results, I must say I have not had the material with which Dr. Holden and Dr. Culbertson have had to deal. These cases are rather infrequent with me. The results in my 30 years experience in dealing with these cases are bad where I have tried to conserve a part or the entire diseased ovary. You cannot tell that an ovary is diseased in an inflammatory case by looking at it, and the results when the ovaries were removed were satisfactory. I want to impress upon you that it was the principle of ultraconservatism which guided me in the selection of cases and in the indications for any operative intervention. In the ante-x-ray days I selected 50 cases of fibroids, every one of the patients above 40 years of age, and alternately I removed the uterus and both ovaries in one series, and in the next, if conditions were favorable, I removed the uterus alone and left the adnexa. Five years after that I had to follow up these cases. In the 37 cases the postoperative condition was slight, was minimal, giving me the impression that it would not make any difference if I left the appendages or not. Again, these patients were all above 40. Since

the x-ray days I have learned to restrict the indications for x-ray treatment of fibroids to women above 40. The artificial menopause is more stormy when they are young, and the ovaries are removed.

DR. ARTHUR H. CURTIS, CHICAGO, ILLINOIS.—In all this discussion concerning pus tubes I hope we do mean a chronic or prolonged infection of the tubes, because we all know pus tubes should not be operated on in the acute stage.

In what Dr. Graves has said concerning removal of the ovaries, he has hit on one point of considerable interest and importance, if one diseased ovary or only part of one diseased ovary remains, there is danger of only partial function.

Within the last eight months I have seen four patients who had previously been operated on elsewhere in whom there has been persistent discomfort, great nervousness, and persistent flushings from the remaining ovary having been left in, and yet not doing sufficient work, so that the patient was relieved from the menopause flushes. If a patient has remaining only one diseased ovary or part of an ovary, there is danger of menopausal symptoms which may persist for as much as a dozen years.

Again, in making a decision concerning how radical we shall be in extirpating the ovaries we must consider the bacteriologic cause of the trouble. If there is a streptococcic or tuberculous infection, we very likely will have bacteria still remaining viable in the tissues, with the result that frequently we will encounter postoperative infection of the ovary with cystic or other serious change. Therefore more radical measures appear indicated in streptococcus or tuberculous infection of the ovaries than in gonorrheal disease of equal severity.

DR. THOMAS J. WATKINS, CHICAGO, (closing the discussion on his part):—The sex glands have much resistance to infection. The testicle has to be seldom removed for infection although it is often infected. The same is true of the ovary. Abscess of the ovary from contamination from the tube is uncommon; I mean a central abscess of the ovary. These generally result from puerperal infections. The nonpuerperal ovarian abscesses are usually infections of recent corpora lutea. The danger therefore of infections of the ovary left after salpingectomy is the presence of a fresh corpus luteum. We have had to remove ovaries after doing salpingectomy, much less common now than formerly.

I concur in all Dr. Culbertson has said relative to high amputation. There have been too many repeated abdominal sections which are distressing to the patient, disturbing to the surgeon, and discrediting to surgery.

I was interested in Dr. Bell's discussion, as we have been in his other discussions, and I was especially interested in the length of time his patients have continued to menstruate after ovarian grafts. I would suggest that possibly the reason some of them have continued to menstruate for so long a time is because they may have had ovarian tissue left incorporated in adhesions. I have had a number of patients menstruate after I supposed I had removed both ovaries. I had left ovarian structure in adhesions. Authentic cases are on record of patients having borne children after both ovaries and tubes were supposed to have been removed.

DR. FREDERICK C. HOLDEN, NEW YORK CITY (closing the discussion on his part).—The principal reason which stimulated a short experimental study with this type of cases was that I have had to reoperate on so many where there was pain following conservation of ovarian tissue.

At Bellevue Hospital scarcely a week passes without our having to reoperate on patients in whom ovaries have been conserved at previous operations. It was with the idea of having better ovarian circulation and consequently fewer painful ovaries, that I tried this operation in gonorrheal cases.

It may be that I have been fortunate in not having any fatality. The morbidity

has been no greater than when more radical operations are done for similar pathology.

These operations were all performed on women under thirty years of age, with the idea of maintaining menstruation and sexual life, and my hope was that I might be able to symptomatically cure 50 per cent of the cases and greatly relieve 25 per cent with the chance of having to reoperate on the remaining 25 per cent. To my mind the possibility of reoperating on a small proportion of these young women is better practice than any radical operation which totally unsexes them.

We have talked this morning about the value of menstruation, but there has been no mention made of sexual life, and we as gynecologists, I am sure, should not let this function pass unnoticed.

In reference to what Dr. Watkins has said in regard to any women having a number of operations, I might say that we had at Bellevue Hospital recently a girl of 19 who had had her third abdominal operation before coming to Bellevue.

DR. CAREY CULBERTSON, CHICAGO, (closing).—I agree with Dr. Watkins that the ovary should be conserved whenever possible, and I agree with Dr. Graves that the ovary is the weak link in the endocrine chain, and that its function largely depends upon the way it is stimulated or inhibited by the stronger elements of this system.

Regarding the conservation of the ovary, a point which Dr. Norris brought out, I want to call attention to the fact that the series I have reported consists entirely of cases of pelvic peritonitis. I have not brought into the series cases of fibroids except those wherein fibroids appeared incidental to the inflammatory condition which brought about the attempt to cure. But I take the same attitude toward the ovary in fibroids that I have in this series. I should like to ask Dr. Bell whether he follows the same attitude, that is, of removal and transplantation in treating fibroids as he does in treating pelvic infections.

I wish to ask Dr. Bell one other question. Reference was made to patients menstruating five years after ovarian transplantation was made, and I would like to ask him in how many cases in which he has transplanted ovaries have the women ceased to menstruate.

The examination of the ovary, which Dr. Curtis emphasized in his remarks, is very important. The ovary should be inspected minutely particularly to find small tumors. I have found dermoid cysts not more than half a centimeter in diameter, and I have found pseudomucinous cysts as small as a centimeter in diameter, but if an ovary gives the appearance of simply cystic degeneration, I prefer to leave it undisturbed. The pain which some of these patients have on one side or the other not only before but after operation, I do not attribute always to the ovary. I think that is a great mistake which gynecologists should not make, to attribute right and left-sided pain to the ovary in every case. I believe the majority of these pains are intestinal. Many of these patients have what the internist recognizes as a colitis.

Recently I have been removing the ovary along with the uterus when the patient was in the climacteric, not conserving it as Dr. Watkins has suggested, for the reason that I believe the climacteric is shortened where it is precipitated. It may be more stormy, but I believe it is shortened just as I believe the climacteric is shortened when the patient is treated for it. Placing the patient under treatment either relieves her of the vasomotor and psychic symptoms or modifies them, but in either case the entire course of endocrine reorganization seems to be shortened.

Regarding Dr. Curtis' remarks, none of the 518 cases were operated on in the acute stage. I accepted the verdict of this society many years ago that operation in cases of acute pyosalpinx or acute pelvic peritonitis is bad surgery.

I think Dr. Watkins is right in emphasizing the danger of repeated operations.

I am inclined to be conservative in young women the first time I operate on them, but patients who have come back after one or two operations, should no longer be treated conservatively.

I have not had the experience of Dr. Holden in treating these chronic inflammatory processes by the conservative procedure which he has described, therefore I cannot say more than this: We all know, of course, that where these cases are drained they will often become symptomless for a period of time. A small proportion of my cases were treated prior to laparotomy by vaginal drainage.

I think it is better to evacuate large amounts of pus in the pelvis before opening the abdomen even if the pus is sterile. We know that some of the cases drained vaginally become symptomatically well, so well that they may refuse further operation. Whether it was an actual return to health or simply a comparative relief from the symptoms, I do not know. I think we have all had that experience, and I can see how the operation which Dr. Holden has recommended would be attended by the relief of symptoms at least temporarily, if not for a long time. But I have not followed the procedure he has so ably outlined.

In reply to Dr. Curtis' question relative to patients showing vasomotor or climacteric disturbances after operation, I could only say that the conserved ovary has ceased to function for one reason or another. I do not know why. So far as my follow-up was effective, no such results were observed in the series reported.

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DR. RICHARD R. SMITH AND DR. WILLIAM J. BUTLER, of Grand Rapids, read by invitation, a paper entitled **Concerning Torsion of the Uterine Adnexa Occurring before Puberty, Together with a Consideration of Torsion of Normal Uterine Adnexa.** (For original article see page 507.)

DISCUSSION

DR. BROOKE M. ANSPACH, PHILADELPHIA.—I have seen one case in a child of 12 with symptoms of acute appendicitis, who had menstruated once, in which the diagnosis was plain because she had a large doughy tumor occupying the culdesac of Douglas.

Whether a normal appendage may undergo torsion I think there is reasonable doubt, but as Dr. Smith has stated, the ovary may have an abnormal attachment to the broad ligament and then it may undergo torsion just as an ovarian cyst may undergo torsion. The tube may be much elongated and very much thickened at its outer extremity so that it presents a pear-shaped tumor, and that may undergo torsion. When these structures have undergone torsion, there are certain structural changes which are the result of hemorrhagic infarction, and it is difficult to say what the adnexa were like before torsion occurred. A number of years ago I collected a series of cases of torsion of enlarged tubes. Some of them were mistaken clinically for acute appendicitis. There was no previous history of pelvic trouble, and then the question arose as to what had been the original state of the tube, and it seems that a majority had been hydrosalpinges which by twisting had become hematosalpinges. In the explanation of certain cases of sterility in women, who have no previous history of pelvic trouble, it would be interesting if we had positive information as to how much influence the exanthemata and appendicitis occurring in childhood, and certain diseases in adult life, have upon the tubes, and how frequently they produce adhesions which close the outer ostium leading to sterility and hydrosalpinx. Since the severe epidemic of influenza in Philadelphia two years ago, many patients as you take their histories, declare that they were entirely well until they were stricken with influenza. The work of Rosenow and Davis who found

metastatic infection of the ovary in cases of streptococcus sore throat is suggestive to say the least.

DR. HUGO EHRENFEST, ST. LOUIS, MO.—The case reported by Dr. Smith was operated on the suspicion that it was appendicitis. I am under the impression that the literature emphasizes this mistaken diagnosis as an important clinical fact. Most of these twists and torsions occur on the right side.

DR. SMITH.—Three to one.

DR. EHRENFEST.—This explains why in most of these cases the preoperative diagnosis is appendicitis.

DR. HIRAM N. VINEBERG, NEW YORK CITY.—Some fifteen years ago I was called by a physician to see a girl, 11 years of age, in whom the diagnosis of acute appendicitis had been made. The abdomen was enormously distended, and the doctor drew attention to that, and thought it was simply a flatulent distention. It was quite evident the child had a large ovarian tumor with twisted pedicle. The diagnosis was simple. In fact, the child was taken suddenly with severe pain which would account for the symptoms caused by a twist of the pedicle. I operated on this girl, and she made a smooth recovery. Since then she has married and has borne children.

I would like to ask Dr. Keene if he can give us an explanation of the fact that in most of these cases that have a twist of the pedicle there are bladder symptoms. It is almost a pathognomonic symptom. In addition to pain, there is frequency of urination. I have never been able to explain this symptom satisfactorily. Of course, in many of the cases, especially in dermoids, the tumor lies in front of the uterus, but there are, as a rule, no urinary symptoms until a twist of the pedicle occurs.

DR. FLOYD E. KEENE, PHILADELPHIA, PA.—The case that I reported was a twisted dermoid cyst lying in close proximity to the bladder. Bladder irritability is more common in dermoids than in the ordinary type of ovarian cyst.

The case I referred to in my paper was a twisted and infected dermoid cyst lying in close proximity to the bladder. Vesical irritability is more common with dermoids than with the other types of ovarian cysts due largely, I think, to the fact that they often lie anteriorly, thus impinging directly on the bladder wall and further, the well-known clinical fact that dermoids are prone to produce irritation in adjacent structures.

DR. CHARLES C. NORRIS, PHILADELPHIA.—I should like to place on record two cases of torsion in apparently normal ovaries. In one case the clinical history is incomplete. The enlarged ovary was about the size of an English walnut. The tube was edematous, the ovary was so densely infiltrated with blood that I could not determine much about it, even by histologic examination. There was neither macroscopic nor microscopic evidence of new growth in this ovary.

The other case, one of my own, showed a similar specimen, occurring in an adult, the left ovary being the one involved. There was no previous history of inflammation, except that an abortion had occurred some years before with some infection. There had been a period of apparently perfect health. The symptoms developed rapidly, and on seeing the patient, I inclined to the belief that she had a small ovarian neoplasm that had undergone torsion. The abdomen was rigid, and the adnexa could not be made out with any degree of certainty. On operation I found an edematous tube; the tube was not, however, twisted, but the ovary was twisted on its pedicle and densely infiltrated with blood. Histologic section showed nothing beyond a mass of blood and there was no evidence of a new growth.

Those cases bring up the question of the etiology of torsion. We all know that

there are certain factors that bear a definite relationship to the torsion of ovarian neoplasms, namely, the size of the tumor, the irregularity of its shape, the length of the pedicle, the amount of intraabdominal pressure, the action of the diaphragm, the peristaltic action, etc. None of these factors, however, has a definite bearing on this type of lesion occurring in so-called normal ovaries. I doubt whether a normal ovary ever undergoes torsion, except when in a hernial sac, or when it is attached to some other structure. One well-known English gynecologist (I believe it was Dr. Bell) some years ago advanced a most interesting theory as to the cause of torsion and which, perhaps, may have some bearing on this type of case. The ovarian circulation is extremely tortuous, corkscrew-like, as it were. The theory as advanced applied to neoplasms and not to so-called normal ovaries. If we can conceive of anything that will cause a partial blockage of the return circulation, the vein, having a thinner coat than the artery, would be the first to become compressed. This would cause congestion, the pumping of the blood into the adnexa by the patent artery would have a tendency to straighten out the tortuous blood vessels, and in so doing would twist the ovary.

Curiously enough, my case somewhat bears out this theory, since on the posterior surface of the broad ligament, corresponding to a point about where the ovarian vessels entered, there was a scar that appeared to me to be the result of a lesion that developed at the time of the abortion years ago, and it is conceivable in this case that the scar may have contracted and thus blocked off the return circulation from the ovary, the constant twisting of the ovary producing the lesion I have just described.

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## THE NEW YORK OBSTETRICAL SOCIETY. MEETING OF MAY 10, 1921

THE PRESIDENT, DR. FRANK R. OASTLER, IN THE CHAIR

DR. J. VAN DOREN YOUNG presented a Report of the **Result Following Radium Treatment of Fibroids,** in which was shown a truly remarkable symptomatic, and actual improvement after one application of radium, and also called attention to the parametrial changes that rendered the subsequent operation more difficult and the hemorrhage at the time of operation more severe.

Mrs. W., forty, multipara, 2 children, oldest eight, youngest four and one-half years. Family and personal history negative. Menstruated every fourteen to twenty-eight days, duration seven to ten days, extremely profuse with many and large clots. Patient stout, weight 143 pounds, very pale, heart and lungs negative. Examination showed lacerated perineum with rectocele, cervix lacerated and badly infected, uterus normal position and motility, an intramural fibroid estimated to be 9 cm. in diameter occupies the fundus. Adnexæ negative. Urine negative. Blood examination: Hemoglobin 52 per cent; red blood cells 4,040,000; leucocytes 12,300. Differential: Polys. 81.2; trans. 2; lymph. 16.2; large mono. .4; eosinophiles .2. Microcytes, megalocytes present. Decided changes in size and variations in shape. Findings suggestive of the pernicious type of anemia. November 5, 1920, patient entered the Nursery and Child's Hospital for observation and local and general care. The period observed in the hospital was as profuse as a severe postpartum hemorrhage. November 22. Radium application by Doctor C. Everett Field, intrauterine, 114.5 milligrams radium element,

screen 1 m.m. silver and gold alloy, period 8 hours. No reaction. November 24, the blood picture improved, hemoglobin 72, red blood cells 4,900,000, leucocytes 8100, differential normal. This in part due to improvement in the focal infection of the cervix. The next period was profuse, the second scanty, none afterwards. February 1, 1921. Blood picture, hemoglobin 85, red blood cells 5,180,000, leucocytes 8600 differential normal, cell changes much less marked.

February 12, 1921. The patient having greatly improved and become a safe operative risk, it was decided to remove the uterus. This decision was reached, after due consideration of the changes in the blood picture, and the lessening of the size of the tumor, and taking all the facts in the case, the possibility of fundal carcinoma, the history, her long semi-invalidism, the blood cell changes and the question of the permanency of the stopping of the bleeding.

Panhysterectomy was performed by the method of Polak, both ovaries and tubes were left in place. Difficulty was encountered by the rigidity of the lower parametrial connective tissue and the excessive hemorrhage therefrom. The patient made an uneventful recovery. The pathologic examination made by Doctor Higgins, showed no malignancy, small fibromatous nodules in the wall, also one fundal intramural fibroid 2 cm. in diameter.

The points in this case are, the change in the blood picture from one suggestive, at least, of pernicious anemia to a rapidly disappearing simple type. The marked reduction in the size of the tumor from 9 to 2 cm. in diameter. The prompt control of the bleeding by the radium application, thereby making the patient a safe operative risk. The rigidity of the lower parametrium. The restoration to health from invalidism, by the combination of radium and surgery, the radium making the surgery possible and the surgery making the radium results permanent. Dr. Young stated in his opinion there are two grave objections to a diagnostic curettage, first there is absolutely no assurance that the curette will find the malignancy, especially is this true in fundal fibroids, second the trauma of the curette is a real danger in freeing malignant cells. A negative result may only give a false sense of security, a positive increases the danger to the patient. It seemed a more logical procedure to trust to the locking up, by the radium, of any possible malignancy in the uterine body, and the removal of the uterus alone, rather than use the curette with its uncertainties and dangers, on this theory the ovaries and tubes could be safely retained, even in the presence of fundal malignancy.

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DR. YOUNG also reported a case of **Aberrant Fibroid, Marked by an Unusual Location of the Tumor.**

Mrs. D., age 40 years. Nullipara. Family and personal history negative. Menstrual history normal. In 1910 was operated upon and a myomectomy done, in the hopes of curing a sterility. Patient complained of pelvic distress and irritability of bladder, worse at times, with occasional severe pain referred to right lower quadrant of abdomen, resembling ureteral block. Examination showed a large mass of fibroids filling the pelvis. A separate mass was felt on the right, apparently in close contact with and pressing upon the bladder.

Operation, New York Nursery and Child's Hospital, January 12, 1921. Upon opening the abdomen a mass entirely separate from the uterus and the uterine fibroids was found, imbedded in the bladder wall and in appearance closely resembling a malignant growth of the bladder. After careful inspection a point of cleavage was found, and the tumor shelled out, the bladder wall was wrapped about it, covering most of the tumor. The peritoneum of the bladder covering the tumor

was destroyed and in the center of this denuded area an artery of some size was found and ligated. This was evidently the source of nourishment of the growth. The bladder wall was carefully repaired. Supracervical hysteromyomectomy was done, leaving both tubes and ovaries. The recovery was uneventful. Microscopic examination showed all the tumors to be hard fibromata, no malignancy found.

The location of this aberrant fibroid was unique, the wrapping of the bladder wall about the tumor, most unusual, and the development of a sufficient blood supply from the bladder wall to keep up the nourishment of the growth, is difficult of comprehension.

## DISCUSSION

DR. JOHN O. POLAK:—I would like to ask Dr. Young whether the uterus was curetted prior to the radium application. It seems to me that that is necessary in cases of bleeding where there is a question of fibrosis or intrauterine polyp or carcinoma of the fundus. That would possibly have saved the woman this operation. The interesting thing is to see how the radium does actually contract these fibroids, and I believe that there are a very large number of these cases that are absolutely cured by the radium and need no surgery whatsoever. If the doctor had waited a few months longer the uterus would have been so atrophied that he wouldn't have found it necessary to remove it, and if he had waited a little while longer and had removed the uterus, he wouldn't have found this difficulty with the parametrial tissues that he did.

DR. H. D. FURNISS.—I recently saw a patient on whom a different form of radiation had been done, namely, x-ray for fibroid. She had been treated for a long period and afterwards came to me for return of the bleeding; the growth had not diminished much in size and she was suffering a tremendous amount of pain. On opening the abdomen I found the omentum plastered densely to the top of the uterus and an absence of fat in the omentum, a condition often found after x-ray radiation. It follows so frequently after x-ray radiation that in some of the foreign clinics they x-ray them from the back with the patients in the knee-chest position and from in front in the Trendelenburg, so as to have the intestines and omentum fall out the way of the rays. In this particular case the bladder was intimately adherent to the uterus and made the operation more difficult.

Another use, I think, for radium is in case of cystocele where there is a rather large uterus that is going to be a little too large for an interposition operation, and that can be very nicely shrunken down so as to make a wedge, within a month or two after the application of the radium.

DR. HERMANN GRAD.—I would like to ask Dr. Young if he does not feel that perhaps there was a little pedicle attached to this uterine fibroid to the cervix. Perhaps it was one of those cervical fibroids that had grown towards the bladder and the bladder covered it.

I would also like to ask Dr. Young, if he thought the second case was malignant, why did he leave the tubes and ovaries? Why not a total extirpation for malignancy?

DR. HAROLD BAILEY.—I do not quite see the justification in Dr. Young's case for the hysterectomy. However, I have had occasion to receive a little criticism and also to criticize myself for a somewhat similar procedure. In the case I wish to speak of the woman continued to bleed, and for that reason I felt that the probabilities were that she had some malignant growth within the uterus, although she had been curetted at the time of the first application of radium. I removed the uterus. The fibroid had vanished. It was a small and very thick

walled uterus, and, strange to say, although treated with just the ordinary dose of radium on histologic examination there was no mucous membrane in the uterus, showing how radium can really do considerable damage.

DR. W. P. HEALY.—I would like to refer to the difficulty experienced in the removal of the uterus in the case previously treated with radium. The experiences that we have had at Roosevelt Hospital after the use of radium have been very different. For instance, I do not believe you can say necessarily at the end of six weeks or eight weeks that it will or will not be difficult to do the hysterectomy. I think it is an equation that deals with the individual case. I have done it six weeks after very heavy doses of radium for cancer of the cervix and did not have any difficulty whatsoever—not any more than one would experience in any hysterectomy that had not been radiated. As this operation of Dr. Young's was done so long after the radium was used I would hesitate to say that the radium was the source of his difficulty. Of course, the question of having done the operation at all is, I think, somewhat open to criticism. We certainly would not think of radiating a case without curetting it and having a very careful examination of the material obtained microscopically so as to protect the patient from any oversight in following up the radium with other treatment if necessary.

The use of radium in intrauterine application in these small fibroid uteri has become thoroughly accepted as a method of treatment and the experience of those of us who have had radium to use on a large number of cases has been, I think, that the majority of cases do well. They may have one period or two periods after the use of a dose of radium—I am going to say 600 to 1200 milligram hours, so that you may have some idea of what I am referring to in the way of dosage, screening with the silver and brass capsule and the thin black rubber tube. After such treatment, 600 milligram hours, the patients may have a menstrual period the next time, but up to the present my experience with them has been that subsequently they do not tend to bleed, and such was the case until I had a report this week from a patient that I treated last August, a bleeding uterus, not a fibroid, and she did not menstruate from the time of the treatment until about ten days or two weeks ago when she had a perfectly normal menstrual flow.

I would like to ask Dr. Bailey with regard to his closing statement in his case that he described to us; that is, the disappearance of the mucous membrane of the uterus after an ordinary dose of radium. I would like to ask him, just what an ordinary dose of radium is in his opinion.

DR. JOHN O. POLAK.—I would like to ask Dr. Healy a question. If he uses 600 milligram hours, does he intend to produce an amenorrhea, or does he intend to reduce the amount of the menstrual period and continue the menstruation? I rather thought that that amount would promote a continuance of the menstruation in moderate quantities.

DR. HAROLD BAILEY.—I think that what Dr. Polak says is applicable. Six hundred milligram hours, in my opinion, is the dose suitable for myopathic hemorrhage cases in which you expect and hope that menstruation will return after nine months or a year, but for the fibroid cases my dose is exactly double that. Twelve hundred milligram hours is the routine dose for fibroids. That stops the bleeding in what I should think, roughly stating it, to be 90 per cent of cases, and 1200 milligram hours I consider the ordinary fibroid dose.

I think one must be a little bit careful about the diagnosis in these cases of hemorrhage where the bleeding returns. The mere fact that the case has been curetted at the time of the first treatment does not free you entirely, because we have had cases where the curettings were negative and the bleeding returned, and then the report from a second specimen came back adenocarcinoma. So I

feel that one should be cautious about accepting the one curetting as proof positive that the case is or is not cancer.

DR. W. P. HEALY.—Dr. Bailey has answered the question completely. I agree absolutely with what he has said. If we have a fibroid in which we want to eliminate the tumor, where we are not considering the menstrual period at all, we use 1200 milligram hours. Where we have just a bleeding uterus and want to cut down the hemorrhage and are not particular as to whether the period returns or not, we use 1200 milligram hours. Where we have a woman who is only bleeding and who wishes to retain her periods, I won't even use 600 milligram hours, but will give her less. I think if you give 600 milligram hours to a woman who wants to retain her menstrual periods, you are taking a very great risk because you may destroy the mucous membrane entirely.

DR. YOUNG. (Closing).—I had hoped to learn of other cases where fibroids had left their uterine attachment and become fixed to the fundal wall of the bladder. I am loathe to believe that this condition is so rare as not to have been observed by any one present.

In answer to Doctor Polak's question I would say that I did not curette prior to the hysterectomy in the second case for I admit a good deal of skepticism as to the value of curettage, under the circumstances, namely a fundal fibroid 9 cm. in diameter encroaching on the uterine cavity and greatly distorting the wall, thus making it difficult to obtain scrapings that would prove the presence of malignancy. If radium was of any value it would surely lock up a malignant area in the fundus and render its removal safe and complete.

Dr. Polak's statement in relation to a longer wait to determine the full amount of benefit to be derived from the radium is important, the radium in this case was applied for the purpose of making the operation possible, which it did.

The patient's history, her long-continued profuse hemorrhages, the blood changes and the uncertainty of a permanent stoppage of the hemorrhage, justified in my opinion the operation, to render permanent the relief obtained and save the patient, and surely her present condition seems to justify this opinion. Her bleeding was severe enough to endanger life and she was fast becoming an invalid. Surely it was good judgment to make a recurrence of this hemorrhage impossible, rather than simply hope it would be.

The shrinkage of the fibroid was most instructive and in a less desperate case would influence my judgment as to waiting.

In answer to Dr. Grad's question as to the possibility of the aberrant fibroid having a pedicle attached to the cervix, I would say that it was absolutely free and implanted on the fundus of the bladder wall forward and to the right.

Dr. Grad's second question as to why I did not remove the tubes and ovaries, surely radium would lock up any possible malignant cells in the fundus and a removal of the uterus would be sufficient.

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DR. FRANKLIN A. DORMAN presented a **Report of Case of Placenta Previa Showing the Result of Blood Transfusion.**

Mrs. G. white, twenty-eight years, para-iv. Normal living births, 1916-17-19. Referred to Woman's Hospital by physician as emergency case. Admitted 12:10 A.M., April 27, with history of painless bleeding (vaginal) 7 P.M. same evening. Amount estimated by patient more than one pint. On admission pulse 116;

blood pressure 130/90; general condition, fair. Examination showed cervix dilated 2 fingers plus, membranes intact and complete placenta previa. Patient immediately prepared and No. 4 Voorhees bag inserted; bag expelled at 6:25 A.M. with moderate hemorrhage. Patient taken to delivery room and cervix found almost fully dilated, membranes not ruptured, internal podalic version, breech extraction. Baby weighed 7 lbs. 12 ozs., all efforts of resuscitation failed. Placenta almost immediately followed birth of baby. Uterus, cervix and vagina firmly packed with 21 yards of 2" gauze. Pituitrin and ergot hypodermatically, hypodermoclysis 500 c. c. saline, condition unimproved; 300 c. c. of gum glucose given intravenously. Patient returned to bed in poor condition, Murphy drip started. Hemorrhage during 1st, 2nd and 3rd stages estimated at 40 oz.; 4 P.M. same day blood transfusion from husband 400 c. c.

BLOOD COUNTS

| DATE | RED CELLS | HGB | WHITE CELLS | POLYS | LYMPHOCYTES | |
|---|---|---|---|---|---|---|
| 4/27/21 | 3,200,000 | 54% | | | | Before transfusion |
| 4/28/21 | 2,336,000 | 52% | 21,400 | 83 | 17 | 24 hrs. after " |
| 5/1/21 | 1,744,000 | | 16,050 | 84 | 16 | |
| 5/3/21 | 1,648,000 | 42% | 13,100 | 68 | 32 | |
| 5/4/21 | 2,456,000 | 44% | 14,850 | | | |
| 5/6/21 | 2,608,000 | 52% | 8,900 | 69% | 31 | |

4/27/21. Patient's blood type, Group 3. Husband's blood type, Group 4. (Universal donor)

5/2/21, 2:30 P.M. second transfusion started, 100 c.c. given, transfusion stopped, patient collapsed, pulse poor quality, chill, marked rise in temperature to 106° F. Until May 6 condition remained precarious, high pulse, high temperature. Since then steady improvement. Since May 5, marked odor to lochia. Examination of lungs showed no dullness, no change in voice, few fine râles at bases, posterior.

5/6/21. Brother's blood typed, Group 4, but corpuscles are agglutinated slightly by patient's blood, Group 1.

## DISCUSSION

DR. HERMAN GRAD.—I would like to add another case of placenta previa with blood transfusion. This was a few days before Dr. Dorman's case occurred at the hospital. I delivered a woman of a 6½ months' baby. She had placenta previa with a moderate amount of hemorrhage after the placenta was delivered and I packed the vagina and the lower segment of the uterus, but not very tightly. The blood pressure was down to 60; the diastolic could not be made out. We gave her 300 c.c. of a solution of 6 per cent of gum and 20 per cent of glucose and her blood pressure came up to 110 with the diastolic somewhere about 50. This held her for about two hours when she had a second hemorrhage. She vomited and expelled a good deal of the packing, and with that came a very profuse hemorrhage and at once her blood pressure dropped to 60 again. We then felt (it was the middle of the night) that she should have some blood. She was typed and it was found that she was a No. 3 and her husband was a No. 2, so we had to go outside to get a donor. Fortunately, we were able to get a donor in an hour and transfused her with 500 c.c. of blood. There was a very remarkable change in her condition at once. She came out of her coma, but within an hour she had a very severe chill. She reacted and for two days she had a subnormal temperature. Then she began to have a rise of temperature up to 104° for about three days when I began to use phenol iodine, giving her a dozen of those injections. Whether that helped or not I do not know, but it seemed

to me it did. She made a very nice recovery. When we started transfusion, she had 45 per cent hemoglobin and after transfusing her with 500 c.c. it was only raised 10 points but the red cells were raised over a million. The change in her condition was very perceptible, and it was really a life-saving measure in this patient.

DR. G. H. RYDER.—I would like to ask Dr. Dorman if, after putting in the bag, he took any precaution to ascertain exactly when it came through the cervix, because if he put the bag in a cervix in which there was two fingers' dilatation it seems to me it is important to find out when the bag comes through the cervix, and, further, because as soon as the bag comes through the cervix and into the vagina hemorrhage can occur and will continue until the bag is removed and the baby delivered, which should be done at once. That might account for some of the hemorrhage after the bag was inserted.

DR. G. W. KOSMAK.—The case reported by Dr. Dorman was of a great deal of interest to me because I have had the opportunity to employ transfusion in several cases of placenta previa at the Lying-In Hospital. I became impressed with the fact that one should exercise a great deal of caution in infusing these patients with blood, for possibly the sudden introduction of so much fluid in the patient's circulatory system may set free thrombi that are in the process of formation and bring about these chills that we so often see after transfusion. Of course, it is possible that the chills are due merely to admixture of the blood, but in cases of placenta previa, where the muscular apparatus of the uterus is not able to close up the sinuses as readily as where the placenta is normally situated, I think the process of thrombus formation is not the same as in the other class of cases, and that emboli are more readily set free when this sudden accession of fluid in the vessels takes place. For that reason in the last case which I observed we delayed the transfusion for forty-eight hours until the woman had recovered from her primary shock, and I think we got a very much better clinical picture as a result. This has taught me a lesson that I shall follow in the future, namely, in all these cases of placenta previa where we feel that the patient needs the stimulus afforded by transfusion to wait until the primary shock is over, until the circulatory apparatus has had a chance to adjust itself, and until the thrombi in the placental site are fully organized.

DR. FRANKLIN A. DORMAN.—We all recognize the fact that placenta previa is a peculiarly valuable field for blood transfusion. In regard to Dr. Ryder's question: I believe that a woman with an extra- or intraovular bag in placenta previa should be watched constantly, and personally I keep such a patient on the operating table. I believe Dr. Kosmak's point is a good one, namely, that in most of these cases we can carry them along with fluid to get over the initial shock, and then give them the upbuilding force of blood. I think we probably overdo the amount of blood that we give. It seems to me in this case this patient really got more benefit from the small, or second, dose of blood (100 c.c.), in spite of her reaction than from the first injection of 400 c.c., which was twelve or eighteen hours after her labor.

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DR. SOLOMON WIENER presented a **Report of the Unusual Life History of a Uterus Didelphys.**

Mrs. C. L. T. first consulted me in October, 1914. At that time she was twenty-two years old and had been married several months; she was bleeding freely after a period of amenorrhea of two months. There had also been a constant dyspareunia. Examination showed a normal vulva; there was a complete vertical

vaginal septum forming a double vagina. At the upper end of each vagina was a distinct and separate cervix with a normal external os, the right one being open, and from it the hemorrhage was coming. There were two distinct and separate uteri, the right one being of the size and consistency of a six weeks' pregnancy, and the left about normal in size. The diagnosis was incomplete abortion with a uterus didelphys and double vagina.

Under anesthesia these findings were even more plainly evident. A curettage for incomplete abortion was performed. The remains of the ovum were in the right uterus. The left uterus was also curetted, and it is of interest to note that it contained a fully developed decidua, although otherwise empty. Sounds were passed simultaneously into both uteri; these showed the uterine cavities to diverge markedly. At no point did the two cavities approach each other, much less was there any communication between the two.

Because of the dyspareunia the vaginal septum was resected, converting the vagina into one normal-sized cavity.

Four months later the patient consulted me again, she being pregnant a second time in the right uterus. This could be felt to be distinctly enlarged, the left uterus remaining approximately normal in size. For the first four months of this pregnancy the left uterus could be distinctly palpated to one side, giving somewhat the same impression as that of a pedunculated fibroid on the surface of a gravid uterus. As the pregnancy advanced the gravid uterus began to overshadow the empty small uterus in the palpatory findings, and in the last months the latter could not be felt at all. This refers, of course, to the fundus; both cervices were naturally at all times distinctly palpable and visible in the speculum.

In view of all I had read and heard about the possibility of dystocia in double uteri, I viewed the approaching labor with some trepidation. However, on October 14, 1915, the patient gave birth to a six pound healthy baby after a normal labor of eight hours. There was no postpartum hemorrhage. At the end of the puerperium the right uterus which had carried the fetus, was well involuted and but little larger than its mate. The right cervix, however, showed a slight bilateral laceration, while the left cervix was virginal.

Five years after the birth of this child the patient again became pregnant. I took it for granted that this pregnancy was also in the right uterus. Great was my surprise upon examination to find the left uterus this time the size and consistency of a three months' gravid organ, the right uterus being distinctly palpable as of normal size. In this third pregnancy conditions were exactly the reverse of the preceding one. The right uterus could be felt for four months to the side of its gravid mate, it now giving an impression not unlike that of a pedunculated fibroid. On January 30, 1921, after a normal labor of twelve hours, the patient gave birth to a six and one-half pound baby. This child was also normal except for a talipes equino-varus of the right foot.

At the end of this puerperium the two uteri were about equal in size; the only change was that now both cervices showed a slight bilateral laceration.

Double uteri are not so uncommon. Usually, however, one is rudimentary and the functions of procreation are carried on by the fully developed organ. The fact that this patient has two uteri both of which have carried a fetus to full term, ending in normal labors, is rather unique. Evidently dystocia and hemorrhage postpartum are rather to be feared in septate uteri, or in bicornate uteri in which one horn is rudimentary. Where there is a true uterus didelphys and the two cavities and organs are separate and distinct, normal pregnancy and labor may be expected.

DR. P. H. WILLIAMS.—A number of years ago at the Vanderbilt Clinic, a

woman came in complaining of a vaginal discharge, and on examination I felt a lacerated cervix, somewhat inflamed, and what I thought was a pedunculated fibroid. On more careful examination I found a septum in the vagina and a fair-sized, normal cervix. The left uterus was the one she had the pregnancy in before and while she was still under my care she became pregnant on the right side.

The peculiar thing about that case in contradistinction to the one reported here tonight was the fact that she was delivered of a full term child from the left uterus. Evidently, the doctor who delivered her never discovered that she had a double uterus and a double vagina, because the septum of the vagina lay more closely to the right side. The right vagina, as I remember, was much smaller than the left. Why she became pregnant in the left side the second time I do not know.

DR. JOHN O. POLAK.—We had a case about four years ago of a woman who had a uterus didelphys and a twin pregnancy on one side and was delivered. The side from which her babies came went through proper involution, but for a very long period until she was curetted in the other uterus she continued to have a metrorrhagia. Now, Dr. Wiener has cleared that up very nicely, and it is a point that we want to think of; namely, that decidua forms in both uteri in these cases. She subsequently became pregnant, just as Dr. Wiener's case did, and she became pregnant in the other side of her uterus didelphys and was delivered of a normal baby.

Two days ago at the College Hospital another case was delivered that had given us a great deal of trouble. Fourteen months ago she came into the hospital with a dead baby and dystocia. A diagnosis was made of an incarcerated fibroid in the pelvis at the time, and as the baby was dead, we delivered it by morcellation through the vagina, and about three weeks later I opened the abdomen to remove this fibroid, and found it consisted of a uterus didelphys. It was not well developed, being more of a rudimentary type, so I did the procedure similar to that suggested and removed half of her uterus, closed the side of the uterus from which the connection came, and she was delivered a few days ago of a full term child, alive, out of the other half of her uterus.

DR. ELIOT BISHOP.—I would add another case to those which have been reported, found in a woman whom I thoroughly curetted for incomplete abortion. She continued to bleed slightly, very dark in color, but as she seemed perfectly well, she went home. The flow persisted and then she had another curettement when the uterus was found to be one of the didelphys type.

DR. W. M. FORD.—I would like to ask Dr. Wiener why he asserts with such comparative assurance that the uterus didelphys had nothing to do with the club-foot. I believe that any deformity of the uterus which predisposes to abnormal positions of the child *in utero*, such as a malposition or a deficient amount of fluid in an otherwise normal pregnancy with an unusual position of the child, might predispose to a club-foot. It seems to me that in a uterus didelphys the possibility of some fetal deformity from cramping of the child *in utero* might be expected. We know these club-feet are very rarely paralytic and are usually the result of malposition.

DR. SOLOMON WIENER.—I cannot give a very satisfactory answer to Dr. Ford's question, but I do not believe that there can be any direct connection unless it be the fact that the mother has a tendency to congenital anomaly which might be hereditary, but the club-foot, as I understand it, is not due to any possible pressure from without, it is not caused by the position of the child in the uterus but is due to shortening of the tendons on one side of the foot.

DR. WILLIAM E. CALDWELL presented a **Report of a Fatal Case of Epilepsy and Two Cases of Chorea in Pregnancy.**

At Sloane Hospital, in the last 20 months, there were four cases of chorea in its more severe form, of which two were reported in detail. To these he added the history of a fatal case of epilepsy.

CASE 1.—Mrs. D. T., twenty-two years of age; admitted to Sloane Hospital, Jan. 29, 1920.

Family history negative. Patient was healthy, normal child until the age of two and a half years, when she had pneumonia and during convalescence contracted measles. This was followed by rheumatic fever, though her doctor called it infantile paralysis. At six years of age she had whooping cough; at 8 she had scarlet fever; at 9 she had diphtheria; at 11 she developed chorea, which lasted for three months, complicated by rheumatism and endocarditis. Was treated by Dr. L. Emmet Holt. She made a good recovery from this and is described as being very healthy and normal, indulging in strenuous exercise such as hocky, tennis and running, while at boarding school, with no bad results. At 17 years of age she had mumps; at 18 she had German measles.

Menses began at twelve years, 33-day type; duration 8 days; flow profuse; always excessively painful and usually accompanied by vomiting and marked prostration, for which she was frequently given morphine. In her eighteenth year she had a dilatation and curettage for this dysmenorrhea with no subsequent improvement.

She was married January 7, 1918, at twenty years of age. A male child weighing nine and a half pounds, was born on Oct. 12, 1918, after a perfectly normal pregnancy and an 8-hour labor. This child at the present time is more than 2½ years old, is perfectly well, and has had no serious illness. During the greater part of this first pregnancy her husband was in France, which caused her considerable anxiety; but there were no symptoms of chorea.

During the fourth month of her second pregnancy, in November, 1919, she developed a skin rash which was diagnosed as pityriasis rosea. There was no tonsillitis or rheumatic pain. During the same month she complained of difficulty in swallowing and of constantly biting her tongue while talking or chewing. Her disposition became irascible and quarrelsome. Soon she began to twitch in the left arm and left foot.

During Christmas week, 1919, she became physically disturbed and emotionally unbalanced. She was admitted to Sloane Hospital; a diagnosis of chorea was made. The treatment consisted of rest, hot packs, bromides and chloral, glucose solution by rectum, and colon irrigations. Her temperature and blood pressure were normal and urine negative. She did not improve and was very unhappy in the hospital. She was taken home with nurses and kept absolutely quiet, the same general treatment being maintained. After consultation, emptying of the uterus was advised. There was some delay in obtaining the family's consent for this procedure. Meantime the patient became very much worse, since it was impossible to nourish her properly or to give her rest. The spasms became almost constant, involving the entire body. The heart became dilated and developed a loud systolic murmur at the apex. Her anemia rapidly increased, showing a hemoglobin of 50 per cent. She developed a temperature of from 100° to 100.8°.

She was readmitted to Sloane Hospital, Jan. 29, 1920, and labor was immediately induced with a No. 3 Voorhees bag, under chloroform anesthesia. Twelve hours later she was delivered by an easy breech extraction, of a six months' female child which lived for six hours. During her twelve hours in labor she

had three doses of hyoscine hydrobromide of 1/200 of a grain, and one initial dose of ¼ grain of morphine. She was quieter during these twelve hours than she had been for several weeks. Immediately after delivery the spasms almost ceased. Some twitchings of the fingers and of the corners of the mouth continued for several weeks. Prostration was marked and convalescence slow. She ran a low grade temperature during the first two weeks' postpartum. A "late systolic" murmur at the apex of the heart persisted with a pulse rate that ranged from 42 to 60. The tonsils were very much enlarged and ragged. Culture showed streptococcus viridans as the predominating organism.

Treatment and medication during the postpartum period consisted of hot packs, forced feedings, arsenic and iron, salicylates and luminol.

She was discharged about March 10, 1920. In May, 1920, she had a severe follicular tonsillitis but no rheumatism and no chorea or heart involvement. Her pulse rate has slowly come up to 80 and her heart is functionally all right. Systolic murmur at the apex persists. She is exceedingly active and never shows cardiac embarrassment.

*Laboratory Findings.*—Two blood cultures: sterile. Blood chemistry: normal values. Urine: negative throughout. Throat culture: streptococcus viridans predominating. No leucocytosis but rather marked anemia.

CASE 2.—Patient, P.S., age nineteen. Roumanian. Married. Admitted to Sloane Hospital March 29, 1921, in twenty-seventh week of first pregnancy.

Father died at 28 years of age: "kidney trouble." Mother alive and well. Two older sisters and one older brother alive and well. No history of rheumatism or chorea in the family.

Never a strong child. Tonsils removed at eight years of age. Continued to have occasional sore throat, with "growing pains." No history of scarlet fever or acute rheumatic fever could be obtained. Did fairly well at school. Popular with schoolmates and had many friends. When sixteen years of age she developed chorea and was treated at Mt. Sinai Hospital for three months. She had no further trouble until she was married, August, 1920.

Menstruation began at thirteen years; 28-day type; duration 3 to 4 days; amount scant; pain slight; last period August 23, 1920.

The patient became pregnant during August, 1920; was perfectly well and happy until October, when she became extremely irritable and unhappy. In November, 1920, she developed a frequent twitching of the left hand and face. This twitching had increased and extended until the entire body was affected. For a few days before entering the hospital the motion had been almost constant and the patient was having difficulty in swallowing.

The patient's temperature on admission was normal, but rose to 100° within a few hours. The blood pressure was normal; the pulse was regular but very fast. She could not swallow and, though she was conscious, could not speak on account of spasms of the throat muscles. The patient was slightly built and undernourished. Purposeless movements of the entire body and extremities were present with short intervals of quiet. The motion was generalized choreiform, affecting all the muscles, and tended to the assumption of extreme attitudes with forcible contractions. Reflexes greatly exaggerated. No pathologic reflexes found. Sensation retained to tuning-fork, of body and head. Cranial nerves all normal. Moderate ptosis of right eye lid. Slight exophthalmos. Pupils equal and reacted to light and accommodation. Eye-grounds negative. Tongue sore; had been bitten. Tonsils markedly hypertrophied. Glands of neck enlarged. Neck not stiff. Heart five and a half inches to the left of the midline in the sixth space. Distinct thrill of apex; very localized. Marked precardial thrust. Long blowing systolic

murmur at the apex. Rate 156. Abdomen showed a pregnant uterus of about 28 weeks. Pelvic measurements normal. Fetal heart 162; heard best left and below. Cervix one and a half fingers dilated.

*Laboratory Findings.* Two blood cultures: negative. Blood count: hemoglobin, 60 per cent. Red blood cells, 3,240,000. White blood cells, 11,600. Polynuclears, 71 per cent. Urine shows some pus and the culture bacillus coli. Blood chemistry: N. P. N., 31.7; urea N., 13.8; creatinine, 1.2; uric acid, 1.9; sugar 0.09; Wassermann reaction, negative. Phthalein reaction, normal. Throat culture shows: right tonsil, abundant streptococcus, few hemolytic; abundant gram negative diplococcus; probably diplococcus mucosus; left tonsil, abundant hemolytic streptococcus; abundant diplococcus mucosus.

Attempts to control the patient with morphine and hyocine, hypodermically, and chloral and bromide by rectum, and the use of hot packs, was only partially satisfactory.

A question which has already arisen in one of these cases, and which must constantly occur, is the advisability of permitting subsequent pregnancies. If the tonsils are removed, and all focal infections eliminated, and the heart is not too seriously injured, should such a woman be allowed to risk another pregnancy?

CASE 3.—Patient M. F., age twenty-one; born in United States, of Italian parents; gravida i; unmarried.

Admitted to Sloane Hospital October 21, 1920, from the Neurological Institute, where she had been under treatment since June for epilepsy and syphilis, having had several injections of salvarsan.

Father died at 58 years of age in an insane asylum. Mother was alive and well at fifty-six years of age. Two brothers alive and well. Two brothers died from tuberculosis. Mother's pregnancies and labors all normal and easy. None of the other children had had epilepsy or shown signs of mental deficiency.

Patient had measles at seven months of age. Fell down stairs at four years of age, resulting in a scar over left frontal region. Otitis media, resulting in deafness at thirteen years of age. Disturbed vision after thirteen years of age. Influenza in 1918. The child attended school from her sixth to her fourteenth year, reaching the sixth grade. Left because she was the biggest girl in the class. At home was tractable; fond of dancing; had many girl friends; worked spasmodically.

Menstruation began at fifteen. Was never well established; irregular and of short duration. Last period not definitely known.

The epileptic history commenced with menstruation. Convulsions usually occurred about twice a month, always at night after the patient had gone to bed. Attack of short duration, followed by intense headache. Attacks had become very much more frequent during the few weeks previous to entering the hospital, with almost constant headache, and an increasing mental disturbance since pregnancy started, in spite of treatment.

Physical examination showed a moderately well-nourished young woman. Would not respond to questions and appeared definitely psychopathic. Temperature and pulse normal. A small scar over left frontal region. Skin and mucous membranes normal. Eyes: Ocular movements and pupillary reactions normal. Small perforation in the left ear drum. Tongue not scarred. Teeth cupped but not pegged; several carious stumps. Cervical glands small but palpable. Thyroid negative. Heart and lungs negative. Breasts enlarged and secreting. There was a moderate lordosis in the lumbar region of the spine. Abdominal examination revealed a uterus about the size of a seven months' pregnancy. Fetal heart present. Extremities negative. Deep reflexes active and equal; no abnormal re-

flexes; no tremors. Axillary, inguinal and epitrochlear glands not palpable. Pelvic measurements normal. Vaginal examination, negative except for a normal 28-weeks' pregnancy. Position vertex L. O. A.

*Laboratory Findings.* Urine, negative. Blood count: hemoglobin 55 per cent; red blood cells, 3,860,000; white blood cells, 8,600; polynuclears, 77 per cent. Blood chemistry, negative. Blood Wassermann ++++. Cord Wassermann negative.

The patient was kept in the hospital four days, pending a decision as to the course to pursue. She had no nervous symptoms up until the evening of the fourth day, when about midnight she began having what were apparently epileptic seizures. From midnight until 11:30 the next morning she had forty convulsions in all, of varying lengths and severity. She was given morphine, chloral and bromides, but without avail. She died at 11:35 A.M. from exhaustion and shock.

*Autopsy Findings.* Brain: both gross and microscopic examination negative. Heart, negative. Lungs showed healed tuberculosis nodules in both upper lobes. Endocrine glands carefully examined and found negative. All other findings negative.

## DISCUSSION

DR. J. MILTON MABBOTT.—I would like to ask whether there were any spirochetæ found, either during life or after death, in view of the fact that she had had so many doses of salvarsan and still had a 4-plus Wassermann.

DR. HAROLD BAILEY.—I recently saw a case of chorea starting about the fifth month, which was of the extreme type. The woman was constantly moving. This case was treated by doses of luminol, 1½ grains three times a day and the dose later dropped to ¾-grain. The seizures became milder within a few days and eventually ceased and she went on to term and was delivered of a normal child. In our service we had felt it wise in these cases to empty the uterus.

DR. FRANKLIN A. DORMAN.—In my service at the City Hospital there were in the last three or four months two cases of marked chorea in young women. The spasms were extreme; they could not sit out of bed. We treated them as a toxemia, and also prescribed luminol. Their condition continually improved and as they came near term we were able to have them sit out of bed. The labors were rapid and normal. I believe that luminol is exceedingly helpful in this condition.

DR. GORDON GIBSON.—There is one thing in cases of epilepsy which we worked out several years ago at Kings Park in trying to refute Dr. Pierce Bailey's idea of the number and character of the cortical cells. We made a great many nitrogen partitions and found if we could keep the nitrogen down to a total of 4 per cent these patients would be free of seizures, and we could predict when they were going to have fits. During that year we did 30 autopsies and upon careful examination of the liver we found that all these cases had cloudy swelling of the liver cells with deformity of the intra- and interlobular veins.

DR. WILLIAM E. STUDDIFORD.—We have had one other case at the Sloane recently, in which luminol was used with very unsatisfactory results with persistent recurrence of headaches. The woman gave a history of one pregnancy which she carried through with chorea developing in the later months of pregnancy. A second pregnancy was gone through without chorea. A third pregnancy developed five months after the second and chorea appeared about the second month and was very severe. There were also intense headache, and mental disturbances, and, notwithstanding the use of luminol, induction was finally carried out in that case.

DR. SAMUEL H. GEIST presented the following case report: **Pyonephrosis and Pyoureter Following Intentional Ligation of the Ureter.**

Experimental investigation on the result of ligating the ureter in a noninfected kidney has demonstrated that one of two results usually obtains, either atrophy of the kidney or the development of a hydronephrosis and hydroureter. Ligation of an infected ureter, however, results almost invariably in a pyonephrosis. The case described was one in which a ureter, apparently noninfected, was ligated with the resulting pyonephrosis and pyoureter. Undoubtedly there must have been at the time of the ligation a low grade infection present.

The patient M. F., age forty-two, married, was admitted to Mount Sinai Hospital on March 14, 1921, discharged April 23, 1921. She had been married twenty-six years, had had seven children, the last nine years ago. Four months previously she was operated upon at Lebanon Hospital for vaginal bleeding. At that time supravaginal hysterectomy and appendectomy were done. She developed a postoperative pneumonia and pleurisy. Following the operation she was catheterized for two weeks. At the time of admission to Mount Sinai Hospital she was voiding four times daily, no hematuria, dysuria, or nocturia. The chief complaint was that she dribbled urine constantly.

Her physical examination was negative except for the local findings. The urethral orifice was gaping, there was a moderate cystocele, cervix was intact, somewhat fixed and to the right of it was felt a small cystic nontender mass about the size of a plum. Cystoscopic examination revealed a normal-sized bladder with left ureteral orifice normal, the right orifice gaping, the bladder drawn out into a distinct pouch on this side, resembling a diverticulum. At the site of this orifice there was no evidence of inflammation. On the left side a catheter was inserted to the kidney pelvis and drained normal urine. On the right side a catheter passed up the ureter for a distance of 3.5 cm., where it met with an obstruction. No urine was obtained through this catheter. Methylene blue solution was introduced into the bladder but none escaped into the vagina. Indigocarmine was injected into the muscle, the bladder urine was voided blue but the fluid in the vagina remained colorless. It was concluded that there was no leak from the bladder into the vagina, that the kidney on the right side was not functioning normally, and that the leak must occur through the cervix. A phenophthalein test showed normal function of a left kidney, 450 c.c. of urine excreted in two hours with 65 per cent of phthalein excretion. The blood chemistry also was normal.

It was decided then to implant the ureter on the right side into the bladder. A laparotomy was done by Dr. Brettauer, exposing the right ureter. Many adhesions were found about the cervix and closely binding the ureter to it. The ureter itself was enormously dilated, the diameter being approximately that of an adult thumb. Close to the cervix an obstruction could be demonstrated, though no communication between ureter and cervix was observed. In view of the enormous size of the ureter and the fact that it contained, when cut across, a clear watery fluid, and there having been no history of temperature or any clinical signs suggesting an infection, it was decided to ligate this ureter in the expectation that the kidney would atrophy. This was done, a small portion of the ureter was resected close to the pelvis for histological examination and the abdomen closed, one small drain being inserted to the ligated ureter. About one week after operation the patient began to complain of pain in the right lumbar region, she had chills and a temperature which rose at times to 105°. A white blood count showed 30,000 leucocytes with 90 per cent polynuclears. Physical examination revealed a large tender kidney. A diagnosis of pyonephrosis

was made and it was then decided to do a nephrectomy and ureterectomy. This I did through a lumbar incision which exposed an enormously distended kidney and ureter. (Specimen shown.) Kidney and ureter were removed and drains inserted one to the bed of the ureter, where it had been ligated and the other to the kidney bed.

The pus from the ureter showed a streptococcus hemolyticus. The patient made an uneventful recovery and was discharged from the hospital well. On discharge her kidney function was normal.

DISCUSSION

DR. H. D. FURNISS.—I think it is usual in all these cases of vesicovaginal fistula, especially if the tract is long from the opening in the vagina to the end of the ureter, to get dilatation of the ureter as a result of constriction of the tract. In this case we have a pointer that the tract was at least 3.5 cm., because he could get a catheter only that far in the ureter. That means it was at least that, but it may have been more.

I think in the treatment of these cases we must establish more than the fact that we have a ureterovaginal fistula. We must know the functional damage which has been done to the kidney and whether or not there is infection. In this particular case there was normal elimination of indigo-carmine and phthalein from the left side, but none from the right, which indicated a marked deterioration of the function of the kidney.

I would like to say right here, however, that indigo-carmine shows lessened function quicker than phthalein, and that you get a complete absence of indigo-carmine at times, especially if there is pus in the urine, when the phthalein elimination will be only moderately depressed.

My criticism is that with a long fistulous tract and evidence of functional damage to the kidney, it was unwise to attempt an implantation and that the better procedure would have been to plan a nephrectomy.

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## NEW YORK ACADEMY OF MEDICINE
## SECTION ON OBSTETRICS AND GYNECOLOGY
## STATED MEETING, HELD MAY 24, 1921

DR. HAROLD BAILEY IN THE CHAIR

### DR. F. W. RICE reported **Two Unusual Cases of Puerperal Sepsis with Gangrene of Extremities.**

CASE 1.—Thirty-eight years of age, married, para-iii, colored, born in the West Indies, entered Bellevue Hospital April 15, 1921, in the first stage of labor. She had previously had one full term delivery and one spontaneous two months' miscarriage, both uncomplicated. For the past ten days before admission, she had had sore throat and an irritating cough. When seen in the clinic three days previously, her tongue was coated, cervical glands enlarged and tender, throat slightly congested; heart and lungs negative. Her Wassermann reaction was negative.

Labor began at 1 A.M., April 15, the membranes ruptured spontaneously at 3 A.M., and she was delivered spontaneously at 5:35 A.M., after four and one-half hours, of a normal, living female child, weighing 4055 grams. The position was an R. O. P. which rotated spontaneously to R. O. A. Delivery of the head was difficult due to slight narrowing of the anteroposterior diameter of the outlet, caused by a prominent tip of the sacrum. Manual pressure on the fundus aided

delivery of both head and shoulders. A mucous membrane laceration resulted, requiring two superficial interrupted sutures of No. 2 chromic catgut. Light chloroform anesthesia was used throughout. The placenta was separated by Schultze's mechanism and delivered by simple expression; the secundines were complete; there was no postpartum hemorrhage. One c.c. of pituitrin was given hypodermically, followed by one-half a dram of aseptic ergot. No vaginal examinations were made.

On the second day postpartum, the temperature, previously normal, rose to 103.9° F., and the pulse to 130. The coryza and cough became more severe. There was headache; the conjunctiva were injected; the skin was dry; abdomen slightly distended, the fundus at the umbilicus, hard, but there was tenderness over the bladder. On the third day postpartum, the temperature went to 105° F., the face and entire trunk became hyperemic, the lips dry and cracked. The fundus was then five fingers, up, with scant lochia and perineal repair clean. On the fourth day the temperature was still 104°; white cells 14,000; polymorphonuclears 74 per cent; lymphocytes 24 per cent, and transitionals 2 per cent. The catheterized urine showed two plus albumin, with many granular casts, quite a few pus and epithelial cells and some unorganized debris. On the fifth day the coryza, cough and rash were all improved, but the patient was irrational; the lochia were thin, watery and odorless; the uterus four fingers up, not tender, and the perineum clean. The tongue was heavily coated, white, with small red areas. A diagnosis of scarlet fever was made based on the rash, tongue and throat conditions. On the sixth day the temperature dropped to 100°, the rash disappeared, but the patient became more irrational, refused liquids and complained of feeling very weak. Her pulse was almost imperceptible, and she plucked at the covers and removed her gown repeatedly.

On the seventh day, the blood culture was reported sterile at forty-eight hours. She appeared markedly improved, though the eyes and throat were still congested. A catheterized specimen of urine showed a trace of albumin with a few pus cells and a few granular casts and much unorganized debris.

On the eighth day the patient was still expectorating white mucus. The night before restraints had had to be applied. The pulse continued imperceptible. For the first time she complained of "sticking pains like pins and needles" in the soles of both feet. There was tenderness and pressure just beneath the internal malleoli of both ankles, none elsewhere. That night there was numbness in the left foot, most marked in the toes and inability to move the toes; no swelling was present. There were sharp intermittent pains and tenderness over the calf muscles and feet.

The ninth day postpartum the patient had a chill in the early morning with a rise in temperature to 102.4°. The lochia became yellow but remained odorless. The eyes and throat were about normal. The fundus was still three fingers, soft, not tender, and the perineum was clean. The left foot showed small, hard, tender veins over the dorsum. Thrombophlebitis was diagnosed. Local treatment included dry heat, cotton covering, and elevation.

On the tenth day, the temperature was 104°, white blood cells 24,000, with 87 per cent polymorphonuclears; the lochia profuse yellowish brown in color. There were marked cyanosis and coolness of the left foot, from the ankle down; edema of the dorsum and a hyperesthetic area, 1½ inches wide, from a beginning line of demarkation in the metatarsal region down. She complained of pain in the right foot and was incontinent of feces.

On the eleventh day postpartum, the temperature ranged between 101° and 102°, the pulse from 140 to 150, the heart sounds were weak and a systolic apical

murmur had appeared. The area on the left foot had spread above the ankle; there was complete anesthesia below and some maceration of the skin. There was a new extension of the edema to the knee with redness and tenderness to the middle of the calf. The right leg showed redness and tenderness over a third of the calf and down. The right cheek showed a swelling in the morning which by afternoon had become ecchymotic, with a similar metastatic area on the third finger of the left hand. The patient perspired freely.

That evening the right foot became cold and cyanotic, but the dorsalis pedis artery was still plainly palpable; this could not be done on the left, however, which was black and cold with the area extending higher medially. There was tenderness higher on both legs.

On the twelfth day postpartum, the rectal temperature was 108°; pulse 148. The patient was unable to speak. The left foot showed extension and bloody discharge. The patch on the right cheek was bleeding. There was a new area of ecchymosis on the right buttock. The left arm was painful when moved and the right was cold. The patient became unable to swallow; dyspnea and pulmonary edema developed rapidly; the pulse became weak and the patient died at 1:00 P.M.

CASE 2.—Thirty years of age, married, para iv, born in the United States, admitted to Bellevue Hospital on April 21, 1919, in the first stage of labor. Her past history was negative except that she stated that she had had puerperal troubles with all her previous children, though her three labors had been normal and spontaneous.

Onset of labor was at 12 M., and at 9:45 the fetal heart became irregular and one vaginal examination was made. Finding the cervix fully dilated, the membranes were ruptured artificially. She was delivered spontaneously of a normal, full term female child, in L. O. A. position, at 10:15 P.M., and the secundines were removed by the Credé method at 10:25. No postpartum hemorrhage or perineal tear. Half a dram of aseptic ergot was given hypodermically. Only one rectal and one vaginal examination had been made. Preparation included a soapsuds enema. Ether was used.

The patient had an uneventful history the first two days after delivery except for cough on the night of the second day which persisted for two days. On the morning of the third day her temperature was 101°; at 2 P.M. she had a chill of five minutes' duration, headache, and a temperature of 104° F. The fundus was three fingers below the umbilicus, firm and slightly tender. The lochia were slightly foul. The lungs were negative. The fundus remained high and firm, and not tender thereafter, until the ninth day when it was much lower. From the fifth to the ninth day the lochia were profuse, thick and foul. That night the patient had chilly feelings.

At 4 o'clock the next morning the temperature was 106° by mouth, and that day a blood culture was taken and reported sterile in forty-eight hours. The severe headache persisted. The tongue was moist and only slightly coated. A soft systolic apical murmur had appeared. The abdomen was distended and a palpable spleen made out.

On the fifth day postpartum, a catheterized specimen of urine was negative for albumin. The white blood cells numbered 15,000 with 76 per cent polymorphonuclears. The Wassermann test was negative. The patient was perspiring freely, the temperature being between 101° and 103° F. From the sixth to the ninth days the temperature ranged from 101° to 104° F. The abdomen remained distended slightly. The patient's general condition improved. Another blood culture taken on the seventh day was reported sterile after forty-eight hours.

On the ninth day the patient said that during the previous night she had had gradually progressive "drawing pains," aggravated by motion in the lower shin and outer side of the left ankle. Examination revealed a slightly reddened area two inches in diameter, on the anterior surface of the right tibia, just above the ankle, not elevated, tender on pressure. About 2½ inches above the left ankle on the external surface of the calf there was a localized swelling slightly reddened and extremely tender on pressure. That evening these involved areas showed definite lymphangitis, the processes were spreading rapidly, and the swelling in the left leg was much worse.

On the tenth day postpartum, with temperature still 102°, the local condition became more marked, and from this time the pain was severe and persistent. Later the right ankle improved, while the left showed increased swelling, redness and tenderness, and in the afternoon ecchymotic spots appeared over the external and dorsal surface of the foot and ankle. The temperature fell to normal.

The twelfth day found the area on the left more ecchymotic and the temperature rising. The catheterized specimen of urine showed no albumin. The white blood cells were 20,000 with polymorphonuclears 90 per cent. The following day a definite line of demarkation appeared at the left ankle laterally and over the dorsum of the foot, with coldness, cyanosis and anesthetic zone below it. Some pain reappeared on the right side, with redness and swelling persisting. On the thirteenth day a quick guillotine amputation was performed at the junction of the middle and upper third of the left calf. No attempt was made at closure for pus had burrowed along the muscle sheaths and fascial planes. The culture showed gram positive cocci, some short chains and some diplococci forms. The blood plate report was "hemolysis, no chain cocci." The day after the operation the temperature was 104° and continued to run a septic course. The patient continued to have severe pain in the left leg, causing insomnia and restlessness. Treatment had been symptomatic except for the operation and Dakin's irrigation. On May 12, the leg became more painful and showed signs of inflammation. On the following day it was worse. Under gas anesthesia an incision was made and several ounces of creamy odorous pus were evacuated from the extensor tendon sheaths. Three incisions were made and ample drainage afforded. The white blood cells were then 18,000. On the 14th day the amputation stump showed streptococci in both culture and blood plates while pus from the incision on the right leg showed gram-positive cocci—no chain effects.

Subsequently the patient's temperature has ranged between 101° and 103°. The stump and the wound on the right leg almost healed. A delay in giving transfusion was caused by difficulty in obtaining a donor. There seemed to be no apparent reason for the continued temperature. The general condition remained about the same.

## DISCUSSION

DR. BAILEY.—In the same hospital service I saw a third case almost a duplicate of the one Dr. Rice presented. The blood culture was at first negative but later showed a nonhemolytic streptococcus. At about the tenth day postpartum she had severe pain in the middle of the tibia. Nothing was found on palpation, but tenderness. On the third day after the beginning of the tenderness there was slight lymphangitis below the area. On the basis of the resemblance of this case to the previous ones, the patient was transferred to the surgical side. An incision was made and there was no pus but the tissues were edematous. On the third day the nonhemolytic streptococcus was found. The temperature dropped after opening the leg and did not rise again. These are

probably three cases of streptococcic blood infection with abscesses occurring at a distance from the wound. I saw the leg that was taken off and the location of the abscess was along the peroneus longus tendon, apparently its origin was from a blood infection.

DR. WILLIAM M. FORD.—I might mention similar conditions that I saw on one occasion just before the epidemic of influenza of 1918. On a Dutch steamship Nieu Amsterdam a large number of persons died on the way to this port and there were a number of cases of influenza aboard when the boat reached New York. A dozen of these patients (more or less) were admitted to St. Vincent's Hospital; about half of them came to the surgical side with a history of having had influenza on the trip over, from which they had about recovered, but they had infections about the hands and feet, more particularly about the feet. The majority of these cases were similar to those reported. In each instance the condition followed a few days after influenza before convalescence was established. We were at a loss to say exactly how the infection occurred. We attributed it to streptococcic influenza; it was either coincident with or followed the influenza and the lowered resistance of the patients probably played a part. One patient died of empyema. The similarity of the cases just reported to those cases leads me to believe that there is no specific connection with labor, that the same thing might follow in any open wound or following an infectious disease, when the patient's vitality is unduly lowered.

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DR. F. W. RICE also reported a case of **Eclampsia at the Sixth Month: Recovery without Delivery.**

The patient was a Porto Rican woman, twenty-five years of age, married, para-i, admitted to Bellevue Hospital on April 19, 1921.

Her past history obtained from her husband was that she was a healthy girl in every respect, except for appendectomy in 1919. She had been married nine months. Her last menses occurred on September 8. For the past two months she had had some edema of the ankles. The day before admission she complained of occipital headache for the first time at 1:00 P.M. That afternoon and throughout the night it continued with increasing severity. At 8:30 A.M. on April 19, the patient had her first convulsion, followed by a second one at 10 A.M.

She was admitted on a stretcher at 4:45 P.M. in a semicomatose condition, evidently in deep shock and could not be aroused by supraorbital pressure. There was some edema about the eyes and ankles, the heart was irregular, the sounds poor, the pulse almost imperceptible, 128; the temperature 101.6°. The blood pressure taken at three different times was 50-40. The abdomen was that of a seven months' pregnancy. There was a floating head and a fetal heart of 144, left and below. Vaginal examination revealed a long rigid cervix of 2.5 cm., the external os admitting the tip of the finger; the internal os was closed. Lumbar puncture revealed a clear fluid under normal pressure; some sugar was present; globulin was negative; the cell count was 6. The Wassermann taken later on was reported one plus; the colloidal gold reaction was negative. The catheterized urine boiled solid, with hyaline and some granular casts. Ten grains of camphor in ether were administered and the patient improved at once; the pulse became stronger, 88, and the blood pressure rose to 140-100. As high colonic irrigations were begun, the first convulsion since she had been in the hospital occurred. The second came on with gastric lavage of soda bicarbonate solution, leaving three ounces of castor oil in the stomach. The Magendie given from 7:30

P.M. to midnight totalled 17 mm. Between 8:00 P.M. and 2:30 the next morning six more convulsions occurred, lasting from 35 to 55 seconds each. Chemical examination of the blood obtained at the time of entrance showed nonprotein nitrogen 24 mg.; creatinine 1.5 per cent; sugar 90; uric acid 2.5 per cent. Hot air baths and high hot colonic lavage were given alternately from then on through the critical period. The patient passed a rather quiet night. Incontinence of urine and feces continued until April 27. Morphine had been given to its full physiologic effect. The patient's respirations continued at from 10 to 14 for the next three days. The temperature had become normal; the blood pressure 130-80.

On the twenty-first, her blood pressure was 162-110 after a night spent almost in mania. She refused and resisted all treatment, medication and nourishment for the next four days. Paraldehyde and fluids were given by the stomach tube. Hypodermoclysis, 1000 c.c., was begun and continued for four days.

On the twenty-third day the blood pressure rose to 206-120, and the patient complained of severe headache. The chemical examination of the blood at this time showed nonprotein nitrogen 26; creatinine 1.4; uric acid 3.0. The catheterized urine showed two-plus albumin with an occasional hyaline and granular cast. On the evening of this day the patient became delirious; her blood pressure went to 195-116.

On the twenty-fourth she had three more convulsions. After the administration of 5 mm. Magendie no more convulsions occurred. Deep coma followed. Her heart and lungs were negative. Irregular uterine contractions were noticed then and occasionally for the next two days. Vaginal examination revealed both the internal and external os one finger dilated; the canal 2.5, and the cervix softer than upon entrance. That evening her coma deepened; respirations were 13; pulse irregular, but of good volume and she perspired freely. The blood pressure was 160-110.

She was in coma and then in a semicomatose condition until the twenty-seventh when she was clinically much improved, was quite rational, had no incontinence of urine and feces. Her blood pressure was 180-115.

On the twenty-eighth and twenty-ninth, the catheter urine had pus cells and albumin but no casts. From then on her course was uneventful. Eliminative measures were continued throughout.

On May 2nd, induction of labor was decided upon, and a No. 3 Voorhees bag inserted at 4:30 P.M. It was expelled at 2:45 the next morning. She was delivered spontaneously at 4:20 of a macerated female stillbirth of 1505 grams. When the membranes ruptured a thin brown sweet smelling amniotic fluid was noted. The secundines came away complete; the placenta showed many large white infarcts, and most of the cotyledons were of rubber-like consistency. No anesthesia was given.

The puerperium was perfectly normal. On the seventh day postpartum her blood pressure arose to 150 and remained so for four days. The blood chemistry test at this time showed nonprotein nitrogen 27.5; creatinine 2.5; uric acid 3.2; carbon dioxide combining power 36 per cent. She complained of sore eyes and buzzing in the head. By the thirteenth day the blood pressure had fallen to 118 with cessation of symptoms.

## DISCUSSION

DR. BAILEY.—The interesting feature in this case is the blood chemistry. As I understand, the blood was normal throughout, yet the woman had albumin and casts. Under such conditions it is rather unusual that the blood should have been normal.

DR. WILLIAM M. FORD reported a case of "**Spontaneous Intraperitoneal Pelvic Bleeding.**"

This case is presented for two reasons. First, on account of the unusual character of the pathology. Second, in the hope that out of the experiences of those present some explanation of the operative findings may be forthcoming.

The patient was seventeen, menstrual history was normal in all respects. She was married one year ago and separated from her husband after six months. There were no pregnancies. The regular period which came on December 8 was free from any unusual symptoms. Two weeks later, on December 22, while at work, the patient experienced a sharp knife-like pain in the region of the sacrum and became unwell; on the following day she was seized with cramps in the lower abdomen which after a day became more generalized. As her bowels, which were usually regular, had not moved for several days, she took a dose of Epsom salts and after this had acted the pain became more or less localized in the right lower quadrant. Gradually it became worse so that on the third day of her illness, opiates were administered to control the pain. The distress in the right lower quadrant, the backache and the flowing continued at the time of her admission to the hospital, which was on December 29. Up to this time she had only vomited once and then after taking salts.

Examination revealed tenderness at McBurney's point and extending less acutely over the lower zone of the abdomen. The abdomen was not rigid. No mass was palpable. Temperature on admission was 103°, pulse 114, and respirations 24. White blood count 7000; polynuclears 86 per cent. Red blood count and hemoglobin on January 2nd were 3,500,000 and 70 per cent, respectively.

I saw this patient for the first time after she had been prepared for operation, with a diagnosis of appendicitis on December 30, 1920. A McBurney incision was made over the tender area on the right side. Before opening of the peritoneum, the presence of free blood in the abdominal cavity was noted. After opening the peritoneum and withdrawing the appendix, an actively bleeding point was found on the side of the appendix away from the mesentery about 1 inch from the base.

As the tip of the appendix was slightly bulbous and as there was a small amount of plastic exudate seen on its tip, it was clamped and cut away. The stump was ligated with plain gut, cauterized with carbolic and alcohol and not inverted. The wound was then closed. The presence of free blood prompted a median incision for the purpose of examining the uterine adnexae. About 2 ounces of partly clotted blood was sponged out of the culdesac. The tubes were examined in turn and in each the process appeared to be similar. Both were patent and neither was enlarged. There were no adhesions, in fact, they appeared to be quite normal save for their peritoneal covering. This was so intensely engorged that the small blood vessels formed a finely reticulated lacework over the entire surface. About 1½ inches from the cornu on each tube was an actively bleeding vessel of minute size. Both ovaries were normal, the right containing a well-formed corpus luteum of recent origin. A figure of eight suture about each bleeding point controlled the hemorrhage from the tubes and the abdomen was closed.

Convalescence was uneventful. The patient continued to flow until January 6. On January 2 she complained of slight rheumatic pains in the left shoulder which lasted for a day or two and disappeared spontaneously. Blood cultures were negative and the coagulation time was seven minutes. The family history was negative. She was discharged cured on the sixteenth day after operation.

DR. D. N. BARROWS reported a case of **Functioning Tube after Abortion of Tubal Pregnancy.**

Most authorities agree that a tubal abortion, unoperated, may be followed by one or more uterine pregnancies, and no doubt many here tonight can remember cases from their practice in which this has occurred. But few, however, can demonstrate the fact shown by this case, that a tube which has been the site of an ectopic gestation is able to resume its normal function in sixteen months. This case proves the statement made by Graves, Kelly, and many others that the mucosa of tubes the site of tubal abortions, even where the hematocele is of large size, sometimes heal spontaneously by absorption of the blood clot, with or without symptoms of infection, or mild toxemia, going on to complete health and later normal pregnancies. If the tubal pregnancy which ends in tubal abortion embeds itself less deeply in the tubal wall than such a process that goes on to rupture, this would explain why the tube in this case was not sufficiently injured to prevent its complete restoration to function. It would also resemble the findings in a case of tubal abortion cited by Howard Kelly where no placental vílli were found in the wall.

The case is that of a woman, twenty-eight years of age, admitted to Bellevue Hospital, December 23, 1917, complaining of uterine hemorrhage and severe knife-like pain in right side. Menstruation was of the 28-day type, lasting four days, and painless. The last menstruation occurred October 22, 1917. On December 23 she was seized with severe knife-like pain in the right side, associated with vaginal bleeding. A diagnosis of tubal abortion was made and on laparotomy the products of conception were removed from the right tube, consisting of large and soft blood clot. Otherwise the tube and ovary appeared to be normal and uninjured. The blood count at this time was as follows: Red blood cells, 2,670,000; hemoglobin 75 per cent; white blood cells 7,000; polymorphonuclears 60 per cent; large lymphocytes 9; mononuclears 31. The pathologic examination showed a large blood clot with irregular pieces of pale placenta-like tissue, scattered chorionic villi, and many foci of pus cells. The diagnosis was tubal abortion with escape of the infected products of gestation into the abdominal cavity. She was found to have a retroverted uterus. She was fitted with a pessary and followed up for several months, and then lost sight of.

The woman was readmitted to the hospital February 6, 1919, when a diagnosis was made of chronic salpingitis, a displaced uterus and lacerated cervix. She was having constant vaginal bleeding, but no pain or nausea. At operation a dilatation and curettage, a trachelorrhaphy, and a left salpingo-oophorectomy were done. The right tube and ovary were normal; the left showed hematosalpinx with infiltration and adhesions. The blood count at this time showed hemoglobin 90 per cent; white blood cells 9,000; polymorphonuclears 78 per cent; large lymphocytes 18. The urine was normal. The temperature was irregular for several days following operation; then became normal, and the patient was discharged with a good result. The uterus was forward in good position. On June 3, 1919, she reported that she had menstruated six weeks before and was having pain all over the abdomen. August 26th examination showed the uterus enlarged to the size of a four months' pregnancy. The uterus was in good position and apparently adherent to the old scar. When the patient was last heard from the pregnancy was progressing normally, conception having occurred via the remaining right tube, the former site of the tubal abortion.

An interesting case reported by Heaney of a tubal abortion, followed by bilateral tubal pregnancies, one tube being removed and the other resected at the

ampullar portion, is one in which the probabilities are very much like those in the present case. Hadden of Oakland, Cal., has reported a case with three ectopic pregnancies, occurring at intervals of about a year. Also we know from a case reported by Dr. Henry C. Coe, cited by Howard Kelly, that a tube containing a lithopedion near the uterine end may be the site of a subsequent ectopic gestation at the distal end.

## DISCUSSION

DR. HARRY ARANOW.—As I understand the case, a hemisalpingectomy was performed on the other tube. There is one possibility and that is that the other tube might have opened after ligation. A tube that has been ligated and resected will sometimes open and become patent, as has been proved. It is possible that in this case the left tube may have become patent again.

DR. WILLIAM P. HEALY.—It is interesting that this tube which had some lesion in it that led to the tubal implantation of the ovum, recovered. Whatever the lesion was, it caused the ovum to remain in the tube and prevented its passing on into the uterus. I am of the opinion that a lesion that kept the ovum in the tube for several weeks before it aborted must have caused considerable change in that tube, and by improving the circulation must have cleared up a moderate amount of stenosis. This lesion gave no indication for removing the tube, as macroscopically it appeared normal. Furthermore, it was the only patent tube the patient had, hence it was reasonable to leave the proximal portion of the tube, inasmuch as we know that where even a small portion of the proximal end of the tube remains intrauterine pregnancy may take place. I think we are apt to be more conservative than formerly in dealing with inflammatory conditions so I see no reason why we should not be just as conservative in dealing with ectopic gestation.

One word more; I have seen specimens of ectopic pregnancy in which the ovary was a part of the exhibit. In my opinion it is very rarely necessary to remove the ovary.

DR. CHILD.—In my opinion tubal pregnancy is no reason for the removal of a tube and ovary. The taking out of a tube because of tubal pregnancy is little more rational than the taking out of a uterus for abortion. The only reason for removing the tube in tubal pregnancy is because the tube is so diseased as to make it a menace to the woman and of no value for future pregnancy. I should like to know why the opposite tube was not inspected at the time of the operation. It is quite important to always inspect the tube of the opposite side, especially if there is any question of the removal of the tube in which the pregnancy has occurred. If there is a healthy, patent tube on the opposite side you may do differently than you would if the tube on the opposite side were occluded. I have one patient with two children born after the removal of the right tube for a hopelessly diseased tubal pregnancy when I inspected the opposite tube and found it occluded. It was opened and eleven months after the woman gave birth to her first baby and she has since had a second child, neither of which would have been born if the opposite tube had not been inspected and opened. I find that the tube will involute following tubal abortion just as the uterus does after a normal pregnancy provided it has not been injured.

DR. BAILEY.—Why was the repair not done at the first operation?

DR. BARROWS.—The left tube was diseased at that time but the patient was in no condition to have the repair done. She could not have stood a thorough operation. The cornu was excised with the tube, but the ovary was fairly free

from involvement, which eliminates the possibility suggested by Dr. Aranow that conception might have occurred in the stump of the left tube.

When we operated on the left side the ovary was found to be bound down by adhesions and for that reason was taken out.

The conclusions are: 1. Tubal abortion does not necessarily destroy the function of the fallopian tube. 2. Such a tube need not always be removed.

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DR. O. A. GORDON read a paper entitled **Conservative Treatment of Abortion; Conclusions from Five Hundred Thirty-two Consecutive Cases.** (For original article see page 521.)

DISCUSSION

DR. C. G. CHILD.—At the City Hospital we pursue an almost directly opposite course from that described by Dr. Gordon in the treatment of threatened and inevitable abortion. In cases of threatened abortion, I hold no great difference with him, except when he states that he allows these patients up on the fourth or fifth day. I see many cases where the cervix is so lacerated as to allow the ovum to prolapse into the vagina when the woman is on her feet, and if we allow these patients up too soon they will abort. I think these cases should be kept in bed and under observation for at least a week.

I do not believe the curette has any use in the treatment of abortion. It should never be mentioned in connection with abortion except to condemn it. This is no time to curette the uterine cavity, because you are very apt by this means to spread infection that may be present. I also believe it is worse than folly to leave the uterus with contained infected products of gestation, it is poor surgery. It is certainly illogical to say that you are afraid to remove the products of infection lest you may infect the uterus when it is already infected.

DR. TOVEY.—I do not think the uterus should ever be curetted. We had an experience meeting recently where everyone confessed to having penetrated the uterus once, twice or oftener. In discussing the question as to what course to follow, it was the concensus of opinion that the uterus should be left alone and the patient watched. I had one patient who had been curetted three or four times, and I finally did a hysterotomy and I found a piece of gauze that some one had scraped over but had not removed. The best treatment for the practitioner to use in the home is to allow the case to "rot out." With that course you get a lower mortality. In a hospital service under aseptic precautions you may go in and clean out the uterus.

DR. HEALY.—It is a very illuminating thing to have 500 cases reported so concisely after having been treated carefully by one person. It is not like a number of cases collected from numerous operators, but is valuable in that the study has been worked out in one institution under one method of treatment. My attitude, however, is directly antagonistic to that form of treatment, based on my experience. One cannot criticize the results in this series of cases; we cannot hope to get better results by any method of treatment so far as the immediate results are concerned, but I want to go a little further and look ahead. The answer as to the value of treatment does not arrive when the patient leaves the hospital in good condition, but later one may find it in ectopic gestation or sterility in these cases that have been treated conservatively. There are no facts by which I can verify or demonstrate this statement, but I believe these patients treated conservatively are less likely to have tubes free from dis-

turbances than patients properly treated surgically. Take the large number of aseptic cases. Dr. Gordon says his cases were bleeding on an average of eleven days. If those cases had within twenty-four hours been taken to the operating room and, under general anesthesia, the uterus emptied—not brutally, but very carefully—they would in a few minutes have been in a clean condition with nothing hanging over them and would have gone on to smooth convalescence. Now contrast that with the patient bleeding eleven days in whom a bivalve speculum is introduced without anesthesia and the vagina packed tight. The vagina has been cleansed before packing, but you are introducing a foreign material into the vagina for twelve or twenty-four hours. I wonder how many of you have removed such a packing after it has been in the vagina twelve hours. Take into consideration that if the woman is not catheterized, she voids over the gauze packing, and after twenty-four hours you have a rather foul condition. Then you are not certain that when you remove the gauze the products of conception will come away. They may not have come away, or she may still be bleeding and will have to be repacked. In my judgment you are gambling when you use this form of treatment; you are gambling with the possibility of future pregnancy. I cannot see any gambling with a properly conducted surgical treatment at all. If we are going to endorse this form of treatment we should remember that the patient may be improperly packed just as she may be improperly curetted. We have to consider which is the safer method of treatment in the hands of the average man in practice. I do not know whether in Dr. Gordon's cases the cervix was packed but if any packing enters into the cervix there is great risk of infection; if it is only in the vagina of course the risk of infection is less.

Dr. Gordon stated that in 18 cases that were curetted the average number of days in the hospital was nine. But as I understand it, they did not curette unless packing failed to control the condition. They had to wait a few days to know that, so this makes the stay in the hospital several days longer than if they were curetted at once.

I want to say that in an experience extending over a good many years in the handling of incomplete abortions in a strictly surgical way, I am of the opinion that the morbidity is on the average no more than you would expect when you consider the large number of induced abortions, and the stay in the hospital is as brief as one can expect to have it after any form of treatment. Furthermore the results so far as future pregnancy is concerned are better than with the best conservative methods of treatment where the patients are merely kept in bed and bleed longer than they do under surgical treatment.

DR. ARANOW.—This subject of the conservative treatment of abortion has been brought before the profession time and time again and we have acquired considerable literature on the subject. As Dr. Gordon has mentioned, we usually reach our conclusions on the basis of our personal experience. In private practice I think a man will have better success if he packs the inevitable cases. In the hospital there is always a physician to look after the patient at any time, but in a private house I think one feels safer if he has packed the patient tightly.

Another matter that comes into the reckoning in the hospital is that when one has curetted the patient and removed the products of abortion the patient is ready to go home in five to seven days in the average case, while under expectant treatment they remain eleven or twelve days or two weeks. In an experience of seventeen years at the Lebanon Hospital I do not remember of a marked reaction to a clean evacuation of the uterus in an aseptic case. Where there is prolonged bleeding if one cleans out the uterus the patient does much

better. In septic cases in which the uterus is large and boggy the products of abortion may be removed by the placental forceps; these cases should not be scraped.

DR. M. O. MAGID.—While I have not treated as many cases as Dr. Gordon reports, I, too, have not used a curette in the past eight years. We get along very well by packing the vagina and then waiting for the cervix to dilate. In a great many cases, after the cervix dilates sufficiently, we can easily peel away all the products of the conception, with one finger in the uterine cavity. Where we cannot succeed with the finger a sponge stick or placental forceps will be of great aid. The curette has outlived its usefulness in these cases.

This paper will greatly benefit the general practitioner who feels that every case of abortion should have a dilatation and curettage. We very often see adnexal disease or other pelvic complications follow these "cleanings." Simple cases will empty themselves by the "packing method." The treatment of septic cases as outlined by Dr. Gordon, can be conducted properly only in a hospital, under the most careful aseptic precautions. The patients cited, that ran a temperature of 100° or 101°, were in my judgment not septic, but sapremic. The sapremic cases may become septic after the introduction of an instrument. The temperature may then go up to 103° or 105°. Once infected, these cases usually run a stormy course. I should like to ask Dr. Gordon whether all the cases with retrodisplaced uterus, whom he had lying on the abdomen for a number of hours each day, had shown any improvement? What about those cases that had congenital retrodisplacement? Had he used any method to determine which cases of retrodisplacement were congenital and which were acquired?

DR. GORDON.—Dr. Rice inquired as to whether we packed the cervix as well as the vagina. In a six or eight weeks' gestation that aborts there is, as a rule, no opening in the cervix so the cervix is not packed, but the vagina is packed tightly. If the cervix is open and there is something protruding it is removed. If the cervix is somewhat dilated it is packed, but no packing was introduced beyond the internal os in any case.

I am glad Dr. Child spoke as he did of the curette and that he has done away with it. Some of those who have discussed the paper evidently use the curette though they have not used that term. Dr. Child has spoken of removing decidua in a primigravada. The cervix is not dilated in an early abortion, and I do not see how you can remove the decidua without dilating the cervix. If you dilate the cervix you subject it and the uterus to considerable trauma. We do not feel at Bellevue that any one is sufficiently dexterous or possesses sufficient surgical finesse to remove the products of conception without subjecting the cervix and uterus to considerable trauma. A. H. Curtis says that in 70 per cent of the puerperal cases there are organisms in the body of the uterus which do no harm so long as they remain in the body of the uterus but are harmful if they get outside of the uterus. I have no more fear of a decomposing mass inside of the uterus than of one in the sigmoid. If we accept Curtis' observations we will not curette and allow these organisms to escape from the body of the uterus. Sampson has demonstrated the arterial system of the uterus both before and after curettage and has shown that the lymphatics in the uterus are not open in an abortion under six or seven months. If there is a fairly well formed placenta and an open cervix with placenta or cord protruding there is no reason why that placenta and cord should not be removed.

If you examine these cases which run a temperature you will find that they are mostly those in which there has been intrauterine manipulation, and sometimes the trauma from such manipulation is sufficient to cause subsequent sterility

or chronic parametritis. We know that we seldom get a pelvic abscess unless there has been a curettage or intrauterine manipulation. If in early pregnancy you dilate the cervix you might as well curette the endometrium.

Some one during the discussion said "properly curette," we do not know what properly curette means. We all know that the general practitioner and most of the hospitals are now curetting practically all of these cases, and this work is left to the house surgeon. The internes assume that every case of incomplete abortion is an indication for curettage.

In reply to Dr. Magid, I may say that of course we did not measure the degree of retrodisplacement in these patients according to the Sturmdorf method to determine whether it was congenital or acquired. We have assumed that it was not congenital and have had these patients lie on the abdomen for eight hours a day.

# Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

## Collective Review

### Blood Transfusion

BY GILMAN S. CURRIER, M.D., NEW YORK, N. Y.

THE early history of blood transfusion is a long one, and there are many excellent reviews of it.[8, 59] More progress has been made since the start of the World War than during its whole history. It is now a safe procedure in competent hands which can do no harm and yet be of immense value, especially if given early, before the need becomes too urgent.

#### INDICATIONS

If blood transfusion is looked upon as a homologous transplant of living tissue, [31] which has been shown to live for at least 30 days in the recipient,[4, 5, 6] the indications are infinite:

1. *In acute hemorrhage*, as substitute for lost blood, it offers immediate relief, when the addition of red blood cells is urgent for further maintenance of vital processes, since permanent degenerative changes have been shown to occur in the body when the exsanguinated condition persists for more than a few hours.[65] In spite of air-hunger, the amount of hemoglobin retained in the severest hemorrhage is above the point necessary to sustain life so that there is a factor besides the mere oxygen carrying power of the R. B. C.[69] While useful in gastric or duodenal ulcer, postpartum hemorrhage, placenta previa, ruptured ectopic gestation, ruptured uterus, typhoid hemorrhage, etc., transfusion becomes imperative when the R. B. C. are one million or less, and the hgb. 20 per cent in acute hemorrhage.[21, 47] When there is reduction of R. B. C. below 4,500,000 in 3 hours, 4,000,000 in 8 hours, 3,500,000 in the first 12 hours in wounded men, the patient dies.[19] If after transfusion a patient improves and then becomes worse, it is a sign of renewed bleeding, as a rule; if the bleeding is not certainly stopped, transfusion can help where saline or *any* other fluid fails.[28] The effect of saline intravenously is very transient, gum glucose solution intravenously is preferable.[28] Blood pressure is another valuable indicator and should not be allowed to go below 70 mm. of mercury.[8, 28] At this level enters the factor of shock, usually combined with hemorrhage. If it is known that the patient has not bled unduly, a solution of gum glucose intravenously is quite as effective as blood, though no better, but easier to give,[25] where a boost of blood pressure alone is the most pressing need.[8, 28] Seventy mm. of mercury blood pressure would be no guide in a patient of a blood pressure of 200 mm.

originally, so that the original pressure or age must be considered. Knowledge of the amount of blood lost is a valuable guide, not available if it is a question of concealed hemorrhage; and although obstetrical cases seem to stand blood loss better than others (the average woman can stand 1250 to 1500 c.c. loss with little or no ill effect), several fatalities are reported in which the loss barely exceeded 1500 c.c.[89] Mere reinjection of serum, however, is not sufficient,[18] so that in cases of bad hemorrhage, while there are temporary measures available, nothing will supplant transfusion of whole blood.

2. *Prophylactic transfusion,* preliminary to, during or just after operation in cases of postoperative hemorrhage or shock,[16] is also indicated in uterine bleeding from malignancy, for fibroids and most conditions described above (1), when prolonged or large hemorrhage is threatened.

3. *To increase coagulability,* as a styptic, where the serum and plasma are most needed, but alone will not suffice. They will work best in the form of whole blood in purpura, hemophilia, and hemorrhages due to the blood diseases; also in hemorrhage of the newborn, for which it is a specific[47, 70] when the coagulation time of the newborn is increased;[70] in oozing from the uterus of a patient who has already lost much blood and in whom the uterus will not contract for that reason;[9] also in the slow oozing provoked by jaundice, more especially postoperative. Paradoxical as it may seem, citrated blood, although containing an anticoagulant, temporarily gives a slightly lower coagulation time in these cases than the whole blood, having equal hemostatic quality.[42, 88] If serum alone is used as substitute for transfusion, which it cannot rival, "serum-serique"[69] (two doses of 10 c.c. each) is said to be very effective (serum from rabbits in a state of anaphylaxis to horse serum). Peptone is also advocated,[85] as also whole blood subcutaneously.

4. *For stimulation of hematopoietic organs.* Transfusion represents more than the mere addition of a given bulk of blood in pernicious anemia, leucemia, secondary anemia due to chronic infection or malignancy.

5. *For toxic conditions,* such as postpartum sepsis or any acute or chronic infection; for bacterial endocarditis, where immunized blood should be more valuable than unchanged blood. "Immuno transfusion"[90] surpasses ordinary methods of serum therapy in septicemic cases inasmuch as we are dealing with compatible human blood immunized *in vitro,* showing definite protective substances which can be incorporated in indefinitely large quantities of blood transfused. They serve the double purpose of new blood and of antibodies. Repeated small transfusions of 250 to 300 c.c. blood are the only remedy at hand in conjunction with general therapeutic measures. Since 23 per cent of bacteriemias, due to streptococcus in postpartum patients, end fatally, and in thrombophlebitis, 50 per cent of the women (with bacteriemia) do not recover, early and repeated small transfusions should be tried, though they are less effectual if there be a local point of sepsis.[12, 47, 63] Puerperal anemia is another field where transfusion is a therapeutic adjunct to arsenic, etc.[79a] In eclampsia, whole human blood from male or female donor seems experimentally to neutralize the toxic effect of the patient's blood to a greater extent than mere dilution with so much fluid.[54] Benzol poisoning and illuminating gas

poisoning are benefited by withdrawal of blood which is replaced with quantities of fresh blood. It is even suggested that leprosy is improved by transfusion, but this seems doubtful.[45]

### RESULTS

If good technic has been employed the results are always excellent—otherwise vary in proportion to the attention given to details. Occasionally, there will be an unavoidable reaction but with due care this will not be great. The individual necessarily profits by the operation because a definite volume of blood has been transferred to him, the R. B. C. of which will survive from one to two months,[4, 5, 6] as ascertained by later count.[6] The serum will transfer antibodies and the whole blood will stimulate the hematopoietic organs to renewed activity.

### METHODS

Methods are numerous. There are many historic reviews.[8, 59] The direct vessel to vessel anastomoses are no longer done, other methods are so much simpler, equally effective, and do not mutilate the donor. Of the indirect methods the paraffined glass receptacle[36] has its limitations and advantages; the method of coating with paraffine has been simplified.[3] The two methods most used today are (1) the syringe-cannula method[44, 91] with its modifications in the form of three-way stopcocks,[26, 40, 83] the ball and valve modifications being too elaborate and too easily put out of order, and (2) the anticoagulant method of using citrate.[1, 34, 42, 88] Citrate has taken the place of hirudin and other anticoagulants. Strange as it may seem, it was found that the anticoagulant did not destroy the hemostatic quality of the blood in cases of oozing, jaundice, melena and purpura.[88] The amount of citrate used has been diminished to 0.2 per cent as a minimum,[42] the majority of men preferring 0.24 to 0.30 per cent when diluted with the blood.[35, 59, 62] From the simple intravenous set for injecting citrated blood, more elaborate methods evolved,[8, 24, 30, 65] but one can always rely on this method. There need be no fear of toxicity of sodium citrate if used in 0.24 to 0.30 per cent strength for 300 to 1000 c.c.[13] On the other hand, the citrate method is generally conceded to be a little more apt to give a very mild reaction.[8, 22] There is no question but that the citrate method is more convenient, although by the syringe-cannula transfusion larger volumes of blood can be given with less injury to the blood used.

### TECHNIC OF CITRATE METHOD

A detailed description need not be presented here.[8, 22, 59] A neat way of entering the vein consists of first transfixing it with a straight intestinal needle.[86] Blood is received in a graduated glass which contains citrate enough to give a final dilution of 0.2 to 0.3 per cent (50 c.c. of 2.5 to 3 per cent sodium citrate dissolved in .85 per cent saline solution for 500 c.c. of blood). It is constantly stirred with a glass rod, care being taken to prevent contact with the sides of the jar or the arm. A large and free stream from the donor is essential. Reinjection of the blood into the patient can be accomplished in innumerable ways. The simplest is filtration through gauze into a bottle which has enough saline to fill the rubber tubing. Thereby, air bub-

bles are excluded while the needle is inserted into the vein. The blood may be kept warm by passing the tubing through a basin of water of the desired temperature, not hot enough to injure the blood. Slow infusion of the blood which in the beginning is somewhat diluted with the saline in the tube, allows one to stop before any of those rare strong reactions, not demonstrable *in vitro*, become pronounced enough to be dangerous. The rate of injection should depend largely on the patient's cardiac condition.

Donors should be subjected to a general examination, a Wassermann test, and must be free from diseases communicable by the blood stream: such as malaria, typhoid (walking), etc. They must be carefully grouped, preferably also matched against the future recipient; promiscuous transfusion without any tests is not to be countenanced. Available candidates should be on hand from Group 4. In case of emergency, great advantage is gained by knowing the reaction of some of the hospital help or other easily accessible individuals. This procedure is endorsed by many,[41] but to a degree contradicted in the report of the Interallied Surgical Conference where it is stated that, "fatal accidents have occurred from agglutination of the blood corpuscles by the donor's plasma, but that the danger of this is relatively small and, therefore, it may be disregarded at an advanced post."[64]

*Isoagglutinins and Isohemolysins.* The prefix "iso-" is used to designate that variety of agglutinin and hemolysin which is effective against the erythrocytes of another animal of the same species as that possessing the agglutinin and hemolysin.[52] Here lies the keynote to successful transfusion. All other details may be perfect, yet if the blood of the donor is incompatible with that of the recipient, grave danger may follow—agglutination may occur alone, but hemolysis is always accompanied by agglutination,[52] with very few exceptions.[57] Exceptions occur perhaps most often in chronic diseases, where repeated transfusions have been given.[15, 47] Easiest test to determine compatibility, if serum of Groups 2 and 3 is on hand: a single drop of blood from the finger tip is placed into a test tube containing 8 to 10 c.c. of physiologic saline or citrate solution. The tube is shaken to give uniform suspension. On each of 2 cover slips a very small drop of corpuscle suspension is placed; to one a drop of serum of Group 2, to the other a drop of serum of Group 3 is added. Serum and corpuscles are mixed on each cover slip, which is inverted over a hollow ground slide and examined under the microscope. Agglutination may take place in a few minutes, but it is safe to allow a half hour at 37° C. to elapse before a decision is made. Serums of various groups differ in rapidity with which they bring about agglutination: Group 3 takes the longest, Group 2 often 15 minutes to a half hour, Group 4, five minutes or less.[48] Serum in capillary tubes, sealed and preserved, lasts six months or more.[49] Many modifications of this test have been made,[11, 74, 75, 76] and it has recently been shown that dried sera do not keep as long as the liquid form.[37] If fresh serum, which has hemolytic as well as agglutinating activities *in vitro*, is used, a mistake may occur by the clumping, being massed or broken up, and the hemolysis then is recognizable only in a diminution of the number of cells remaining in the preparation; therefore, examination must be made immediately after setting up.[15] In newborn infants also it has been found necessary to match the baby's blood against the mother's,[29]

contrary to the usual custom.[14] The important thing to bear in mind is that it is the cells of the donor against the serum of the recipient that one ordinarily tries out, the donor's serum being so diluted that it is usually harmless. A medico-legal application has been worked out that makes use of the transmission of these reactions,[58] which, however, are not established permanently until the first or second years of life.[29] With slight changes the figures of the original grouping of Moss still hold good.[17] The amount of reaction *in vitro* is no criterion of how severe the incompatibility will be *in vivo,* therefore, it is necessary to have a perfect match, when grouping is done.

### DANGERS OF TRANSFUSION

Three types of accidents may occur: (1) acute cardiac dilatation; (2) embolism of air (less dangerous than supposed) and of clotted blood, these two accidents and the one following should not occur with due care; (3) introduction of infection into the blood serum (syphilis, typhoid, malaria); (4) agglutination or hemolysis reactions of which there are three types: (a) following the use of compatible bloods—a slight chill and rise of temperature, (b) so-called hemolytic reaction following the use of incompatible blood, (c) severe reaction, rarely occurring in patients who had previously received many transfusions of blood from a donor of the same group, therefore, compatible in the ordinary sense. The first two accidents are prevented by adequate care and cleanliness and lack of trauma to the blood,[22] and proper tests; the last is unavoidable and manifests itself after the introduction of from 50 to 100 c.c. of blood, therefore, transfusions must be started slowly, so that they can be stopped in time to avert a catastrophe. Its symptoms are tingling pain, fullness in the head, distress about the chest, later, excruciating pain in the lumbar region; then follows cyanosis, labored breathing, slow pulse, loss of consciousness, urticarial eruption; finally, rapid pulse, cold and clammy skin, chill, high fever (103° to 105°), in all, the symptoms of anaphylactic shock. Jaundice and macroscopic hemoglobinuria develop later.[15, 22, 60] If the transfusion is stopped early and fluids (glucose) are given intravenously with adrenalin and atropine, the condition usually clears up. These reactions in cases where the blood has been properly grouped, are thought to be caused by the liberation of toxic substances, probably from platelets in the incipient stages of blood coagulation. This can be avoided by fairly large needles and short tubing, and, in case of obstruction or stoppage, by the use of a new needle and tubing.[49, 67, 77] Therefore, the cleaner the apparatus is, and the less the blood is injured, and the more quickly it is injected, the slighter will be the reaction. Citrate may slightly injure the cells.[22] A further explanation of this reaction, simulating an anaphylactic shock, and by it a possible means of avoiding it, may be found in the fact that the liquor obtained by grinding a toxic serum, has become nontoxic to cells (R. B. C. or leucocytes) to which it formerly was toxic.[10]

### AUTOINFUSION

The most noteworthy progress in transfusion of blood, brought out in German literature during the war, is the procedure of reinjecting extravasated blood after modifying it, intravenously, intramuscularly, or intrarectally, a method originated by Thies[82] in 1914. The first im-

pression of this autoinfusion of blood is one of impracticability, but it is endorsed, especially for cases of tubal pregnancy, so unreservedly by such authorities as Bumm, Doederlein, etc., that it may be well to give it more careful consideration. In German work on transfusion not enough emphasis is placed on the value of grouping patients. This may account for some of the accidents simulating those resulting from hemolysis or anaphylactic shock. The proportion of citrate used in all their transfusion work is much greater than that used in this country.[80] Doederlein adds five cases of autotransfusion to a total of fifty-one in April, 1920. An outline of his technic is as follows: A soup ladle or large spoon or grooved retractor is used to remove the blood from the peritoneal cavity; this means less trauma to the blood than suction. The blood is allowed to flow, by gravity, into a funnel covered with several layers of gauze. It is filtered into an Erlenmeyer flask where it is mixed with 1 per cent sodium citrate solution in the proportion of 3 parts of blood to 2 of citrate and kept at body temperature. By means of an intravenous set it is poured into the inferior mesenteric vein, or a vein of the leg,[38] arm, or injected intramuscularly or subcutaneously, but preferably into the internal vena spermatica (ovarian) into which an assistant meanwhile has inserted a cannula with a lumen of 3 to 5 mm. (the last vessel rather awkward to get into?). If possible this is not done until after active bleeding has been stopped.[20, 72] All of the cases with unfavorable symptoms recovered. The amount introduced varies from 500 to 1000 c.c. Doederlein does not agree with Opitz and Olshausen,[55] that free blood left in the peritoneal cavity is rapidly reabsorbed. Therefore, after removal of the blood to be used for reinfusion in ruptured ectopics he washes out the peritoneum with 20 to 30 liters of saline solution at body temperature. (It has been shown that 100 c.c. of defibrinated blood is absorbed from the abdominal cavity of a dog in 24 hours.[80a]) It is uniformly emphasized that fresh blood must be used for autotransfusion, and these are the cases, that most urgently need transfusion. But in cases of recurrent bleeding, where fresh blood and old hematomata are found, one can still employ this method. Some of the unfavorable reactions are due to decomposed blood. How long extravasated blood is usable depends on the vitality of the R. B. C. Their products of destruction may be of value in exciting formation of new blood. Lest the blood clot intravenously (a debatable question), the citrate is added or it is defibrinated. Hemolyzed blood is assumed by some not to be harmful.[7] Another advantage claimed more particularly in obstetrical cases is that the blood of autoinfusion brings back into the patient's body her own R. B. C. and serum, which at the end of gestation contain certain products that cause contractions of the uterus.[78] The rectal injection is more applicable in obstetrical cases because of the greater likelihood of contamination of the blood escaping from the uterus. Lichtenstein and Tuffier[79] emphasize that the value of autoinfusion of blood lies not only in the incorporation of a small amount of blood or a large number of R. B. C., but in reincorporating blood and living autogenous, nonhemolytic blood and serum and internal secretions. Placental blood given intravenously to criminals[79] has proved fatal because of the multiple emboli from placental villi, filtered out only partially by means of many layers of gauze. Rapid injection of placental blood killed animals, slow injection had no effect, another feature favoring

intramuscular or rectal injection in obstetrical cases. It is the equivalent of a nutritive rectal injection with favorable absorptive qualities, furthermore containing serum and hemoglobin.[79] One case absorbed 2000 c.c. from a total of 2250 c.c. (saline and blood) injected rectally. The intramuscular employment shortened convalescence perceptibly as the result of stimulation of blood building organs.[72] The quantity of reinfused blood was not material as shown by hemoglobin determinations.[72] Autoinfusion was successfully used in[20] (1) splenic rupture and hemorrhage by Von Peiser and Rauft; (2) liver rupture by Kreuter; (3) gun-shot wounds involving large intraabdominal vessels; (4) wound of the lung by Henschen; (5) ectopics; (6) such obstetrical complications as postpartum hemorrhage, placenta previa, etc. All of the cases fared well, and presumably would have died without this measure. Two or three exceptions are mentioned, notably by Opitz[55] and Albert.[2] The latter had a case which showed cyanosis, pain in the small of the back, hemoglobinuria, and icterus, i. e., all the earmarks of the reaction following transfusion with incompatible blood. This was perhaps due to the fact that the blood had disintegrated too far.

Some of the advantages claimed are: (1) absence of emboli (dependent entirely on the manner of filtration); (2) no hemolysis (which should not occur by using proper test for blood from another individual); (3) sufficient quantity of blood, available at once with no time lost in getting it, (although it will embarrass the operator, when a patient is in critical condition, to prolong the anesthesia in order to make the transfusion into a vein inside the abdomen; donors should be available, especially of Group 4, among the employees of the hospital); (4) testing and grouping not required (it is not as hard as one might infer); (5) there is no need for a Wassermann on the donor.

On the other hand: (1) the blood is not always sterile, even from the abdominal cavity[2] as the odor of colon bacillus sometimes betrays; (2) one never knows how long since the intraabdominal bleeding took place; old blood implies the danger of reaction and might not have any better nutritive value than plain glucose[25] per rectum, or gum-glucose solution intravenously; (3) large quantities of fluid blood are quickly absorbed from the abdominal cavity;[80a] (4) hemoglobinuria and icterus in a few cases are suggestive of hemolysis due to toxin of destruction products of already deteriorating blood; (5) too rapid an injection of blood is necessary if an intraabdominal vein be used and the anesthesia not be prolonged unduly; 1200 c.c. have been reinfused within 6 to 8 minutes in one instance,[43] which could predispose to acute cardiac dilatation; (6) on account of the pain caused by the subcutaneous injection it must necessarily be done under anesthesia. Except for the fact that one has the blood at his immediate disposal in these cases of acute hemorrhage Albert may be right in saying that the procedure has no especial advantages but brings dangers which we should not disregard; especially when the steps of an ordinary transfusion are so simple in competent hands combined with the removal of clots (leaving saline in the abdominal cavity) and the administration of glucose per rectum or intravenously. Furthermore we do not often see fatal ectopic gestations. The majority are doing well even without transfusion, although it is an excellent supplementary measure, because it shortens convalescence and, in cases of postpartum hemorrhage or placenta previa, lessens the tendency to sepsis, to which exsanguinated

cases are more susceptible. It is customary now to group placenta previa patients as soon as their condition is diagnosed.

In conclusion it cannot be too strongly emphasized that early transfusion, even at the risk of performing a seemingly needless operation, is far better than waiting until too late as is so often the case, when failure is inevitable. Prophylactic transfusion is becoming more and more employed on account of the harmlessness of it in competent hands.

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# Selected Abstracts

## The Newborn Infant

**J. Whitridge Williams: Obstetrics and the General Practitioner.** The Pennsylvania Medical Journal, 1921, xxiv, 290.

The author confines his essay to several simple topics which he has found from experience to be of great practical importance and yet most often neglected by those doing obstetrics.

Prenatal care concerns mother and child. One of its most important features is the routine and frequent examination of the urine for the detection of the early stages of toxemia and for the prevention of eclampsia by proper treatment. Eclampsia is the most serious of all conditions with which the trained obstetrician has to cope, and even in his hands the mortality is approximately 20 per cent. The disease is almost entirely preventable. Proper guarding against undue exertion in the last third of pregnancy will diminish the incidence of premature labor. The serious significance of any form of uterine bleeding during pregnancy should be impressed upon the patient. A thorough antepartum examination six to eight weeks before the expected onset of labor should be insisted upon.

Considering the child, the scope of prenatal care is immense. In this country 125,000 children die each year before they have completed four weeks of existence, and it is particularly with the prevention of such deaths that prenatal care has to deal. A critical study of 302 fetal deaths, occurring from the time of viability onward and including the two weeks immediately following delivery, showed that 72 per cent of the entire number were due to syphilis, dystocia, toxemia, and prematurity in the order named. Syphilis alone was responsible for 34.4 per cent. This however, does not include the syphilitic children discharged alive or those which developed congenital syphilis later. When syphilis has been determined as the cause of stillbirth, treatment should be instituted during the puerperium, so that the disease would be cured before the beginning of a new pregnancy.

Conscientious prenatal care could obviate the loss of at least one half of the children who now die during the first month following delivery.

Contracted pelves are far more frequent than was formerly thought, occurring in about 35 to 40 per cent of the colored women and in about 8 per cent of the white women. The important practical conclusion which the author has drawn from many years of study of contracted pelves, is, that 75 to 80 per cent give birth to their babies spontaneously.

The mortality rate from puerperal infection has been reduced to a small fraction of one per cent in hospital cases, while in private practice the mortality rate shows practically no change since pre-antiseptic days. About 45 per cent of all deaths occurring in childbed in this country are due to preventable disease. As a means toward avoiding puerperal infection, abdominal palpation and rectal examinations rather than vaginal examinations, are strongly advised. At least 80 per cent of all deliveries can be conducted satisfactorily by this means alone.

The dangers from the improper use of pituitrin are duly emphasized by the author. In his opinion its administration may be indicated when the cervix is fully dilated, the head on the pelvic floor, and only a few strong pains necessary to complete delivery, and occasionally in multiparae with deficient uterine contractions and the head still high in the pelvis, provided there is no disproportion and the cervix is fully dilated.

Postnatal care with especial reference to the discharge examination is urged. Such an examination occasionally reveals the existence of unexpected lesions, and enables the practitioner to tell his patient that some operative procedure will be required for its relief in the future, and thus obviates the reproach so often made when its necessity is discovered later. NORMAN F. MILLER.

**Ballantyne: Problems in Population and Parenthood.** Edinburgh Medical Journal, 1921, xxvi, 55.

The report covers the conclusions and recommendations of the National Birth Rate Commission (41 members of both sexes) acting between 1916 and Nov. 21, 1919, and is grouped under five heads.

The first deals with recent alterations in the birth rate, largely due to the war. The legitimate birth rate in England and Wales fell from 23 per 1000 in 1913, to 16.6 in 1918, and in Scotland from 23.7 in 1913, to 18.6 in 1918. Ireland showed a decline from 22.2 to 19.1 in 1917. Illegitimate births in England and Wales while increasing slightly as a whole, rose from 4.3 per cent to 6.3 per cent of the total births. The total loss of births in England and Wales attributed to the war was estimated at 543,087. Differential fertility (almost negligible in the middle of the nineteenth century) was found to be much lower among the upper and middle classes than among the manual workers.

The second section contains the conclusions reached regarding the voluntary restriction of birth rate. Except therapeutically, no means should be used to terminate pregnancy when there is any possibility of pregnancy having taken place. Degenerates and defectives should not bear children. No contraceptive measures which could injure the health of potential parents or children should be used. Selfish reasons are not an excuse for childlessness. It is the duty of society to remove the

disabilities which are imposed upon worthy parenthood. Two reports were presented by fifteen members who, without religious or moral objection, discussed the dangers of contracepts. Eleven (5 physicians) considered them harmful both to health and happiness. Four (1 physician) thought the best contraceptive measures harmless. Endowment of motherhood and the care of unmarried mothers was endorsed.

Section three deals with infantile death. The conclusions were that the great loss of population before and immediately after birth is largely a problem in obstetrics so far as antenatal, intranatal, and neonatal deaths are concerned, and a problem of lactation and milk supply for deaths of infants occurring later. New and constructive means of dealing with these problems are needed.

The fourth section, "Contributary Causes of Loss of Population" is concerned with syphilis, gonorrhea and alcoholism. Syphilis causes 27,000 deaths annually in England and Wales, (20 per cent of the antenatal, intranatal and neonatal deaths). The Minister of Health was advised to call to the attention of the people the advantages of the use of prophylaxis or early treatment after promiscuous intercourse. Compulsory notification and treatment of venereal diseases is recommended.

Section five advocates education of the young for worthy parenthood including instruction in sex, hygiene and allied matters. The report is a document of immense importance and the minor differences of opinion are to be expected from the composition of the body. H. W. SHUTTER.

**Glynn: Factors in Fetal Mortality.** Pennsylvania Medical Journal, 1921, xxiv, 699.

The successful handling of obstetric cases requires more than the mere knowledge of obstetric and surgical procedures. It requires real obstetric judgment to determine the proper course for a happy outcome in the complicated labor. A thorough knowledge of the mechanics of labor and the general condition of the mother is necessary. One must be able to recognize early any pathologic condition and then carry out the particular treatment best suited to that case.

The chief faults in our present methods of the conduct of labor are the tendency to interfere too hastily and the excessive use of drugs, particularly morphine and pituitrin. Borderline cases of pelvic contraction should be measured internally before the onset of labor. In the treatment of eclampsia the author still agrees with Peterson in emptying the uterus after the first convulsion. Labor should be induced in pre-eclamptic states, grave toxemia of pregnancy, postmaturity and in the borderline pelvis. High forceps receive their just condemnation. For the case not in the hands of the expert, the author feels that Potter's method of version is preferable to the use of high forceps.

H. W. SHUTTER.

**Schumann: Practical Aspects of Antenatal Hygiene.** Pennsylvania Medical Journal, 1921, xxiv, 693.

The author divides antenatal hygiene into three distinct groups: First, the sociological factors of housing, food, sanitation and occupation as applied to the pregnant woman; second, the care of the woman from the standpoint of recognition, prevention and treatment of infec-

tion, toxemia and other disease present; third, the prevention of birth traumatism by careful estimation of the maternal pelvis, the size of the fetus, etc.; and the conduct of labor to the best interests of mother and child.

Since the state is dependent for its perpetuation upon the quality and number of its citizens, the problems of antenatal hygiene are the concern of the state. The physician's duty is to guide, counsel, and aid in awakening public sentiment. Positive eugenics is a biological error and a biologic impossibility. Tuberculosis, since it must be bred out, is not considered a contraindication to marriage.

In the practical application of prenatal care a thorough examination including the heart, lungs, thyroid and pelvis should be made as soon as pregnancy is suspected. The blood pressure, urine analysis, Wassermann (if indicated) and possibilities of dystocia should be noted. The blood pressure and urine analysis should be noted once a month until the seventh month, twice a month after. The activities of the mother are not curtailed. Syphilis is treated vigorously. A rise of 10 mm. in the systolic blood pressure should place one on his guard against possible toxemia. H. W. SHUTTER.

**Beck: End-Results of Prenatal Care.** Journal American Medical Association, 1921, lxxvii, 457.

After setting forth the details of prenatal care as applied in the service of the Long Island College Hospital, Beck compares the results obtained in a series of 1000 consecutive cases receiving this care, with similar series receiving only prenatal nursing supervision and those receiving no prenatal care whatever. In 1000 cases receiving no prenatal care, there were 76 infantile deaths under two weeks; in those receiving merely nursing supervision, there were 47 such deaths; in the series receiving complete prenatal supervision, there were only 25 deaths.

It is interesting to note that for 106 cases of abnormal pelves, there were only 8 cesarean sections, 22 forceps applications and one craniotomy required in the series. There were only four maternal deaths, one due to pneumonia and three to puerperal sepsis, all occurring during the influenza epidemic. Seven patients had suppurative mastitis and in 59 the temperature exceeded 99° during the puerperium.

While few of the patients had troublesome emesis gravidarum and only four infants were lost due to toxemia, Beck's results in the prevention of abortion in general were discouraging. R. E. WOBUS.

**Eden: The Mortality of Premature Infants.** The Lancet, 1921, cci, 127.

The author briefly discusses the methods, old and new, of determining prematurity in newborn infants. He emphasizes the need of additional means of determining this factor.

With respect to premature infants he believes that the cases should be grouped; indicating (1) *mortality at birth*, including macerated fetuses, nonviable fetuses, and those which, though born alive, do not survive their birth; and (2) *mortality in infancy*. The former group is largely uncontrollable. Improvements in obstetric management, however, might enable a certain number to be saved, as in cases of toxemia,

antepartum hemorrhage, and syphilis. The second group, the one with which we are chiefly concerned, shows a gross mortality of 40 per cent. In other words, nearly half the premature babies born alive die before the end of the third week of life.

The percentage mortality of selected premature babies (which have no obvious disability in addition to their prematurity) may be anything from 35 to 50 times as great as that of mature babies born under the same or similar conditions.

Not much information is available as to the cause of this heavy mortality among the premature infants. Yet it is fairly safe to assume that the predominant factor in death from prematurity is malnutrition. The fatal susceptibility of premature infants to infections of all kinds must not be overlooked. Their tissues have not yet elaborated a defense against bacterial invasion and are, therefore, incapable of resistance.

The great importance of breast feeding for premature infants is emphasized. No doubt breast-fed babies do receive with the milk, immunity bodies, serviceable for defensive purposes.

NORMAN F. MILLER.

**Ehrenfest: Intracranial Birth Trauma of the Newborn from the Standpoint of the Obstetrician.** Journal American Medical Association, 1921, lxxvii, 103.

Intracranial birth injuries are produced by the mechanical exaggeration of the physiologic process of molding, resulting in excessive or sudden compression of the fetal skull; they are prone to occur in the course even of a normal labor if prematurity predisposes the infant to traumatic lesions; and they are necessarily aggravated by a hemorrhagic diathesis or by inappropriate manipulations during resuscitation. Upon these premises, Ehrenfest briefly bases the more or less obvious prophylactic and therapeutic measures to be employed by the obstetrician.

Forceps should be carefully applied with the minimum amount of compression. Extraction should be slow to permit gradual molding of the head. In breech cases, the head should remain flexed, strong pressure of the occiput against the symphysis is to be avoided as well as undue haste. Large doses of pituitary extract are dangerous. Episiotomy is preferable to extreme measures to protect the perineum. All brusque maneuvers must be avoided in resuscitation.

The diagnosis of intracranial lesions must be made early. In suspected cases the clotting time should be taken. Spinal puncture is a measure both of diagnostic and therapeutic value. R. E. WOBUS.

**Hereford: Birth Trauma.** Southern Medical Journal, 1921, xiv, 542.

For the year of 1918 the mortality statistics for the registration area of the United States showed 6,149 deaths due to birth trauma.

Many infants surviving the immediate effects of birth trauma later develop into idiots, epileptics, feebleminded and insane. Some become deaf, dumb or blind.

The author believes intracranial hemorrhage to be of far more frequent occurrence than is generally supposed. The so-called hemorrhagic tendency of the newborn infants, or those dying within a short

time after birth, show hemorrhages in the dura, over the brain surfaces or in the ventricles. Some show hemorrhages in other organs of the body. The edema produced during difficult delivery may prove the more serious factor in some cases. Symptoms appear immediately after birth, or more commonly after two or three days.

The author believes lumbar puncture of the greatest diagnostic importance as well as excellent treatment. He advises daily repeated lumbar punctures withdrawing 10 to 12 c.c. of the bloody spinal fluid until the pressure of the fluid does not exceed 10 mm. In babies in whom the cerebral spinal fluid reaches a pressure of 15 mm. or higher, associated with other positive findings of increased intracranial pressure, a subtemporal decompression and drainage is advised.

NORMAN F. MILLER.

**Greenwood: Artificial Respiration in the Newborn.** British Medical Journal, April 23, 1921, No. 3147, p. 601.

The infant is held with the back of the neck on the palmar surface of the left hand, the occiput being supported between the thumb and the forefinger which grasps the mastoid. The ankles are held firmly from behind with the right hand. The child is held head upwards at an angle of about 15 degrees from the vertical. The child is allowed to move rapidly downward about two feet. It is now inverted, the head being downward. The infant is again moved smartly downward for a distance of about two feet. The movement of the abdominal viscera away from and toward the diaphragm stimulates cardiac and pulmonary action.

F. L. ADAIR.

**Formichella: Amniotic Hernia Corrected by Operation.** Journal American Medical Association, 1921, lxxvii, 465.

The case here reported is that of a full-term female child that was well developed and normal except for a hernia the size of a grapefruit protruding from an umbilical opening the size of a half dollar. It contained intestines which were plainly visible through the enveloping sheath of the cord. Under ether, an incision one inch in length was made above and below the umbilicus, the contents reduced, and the abdomen sewed up with catgut. The child made a good recovery.

R. E. WOBUS.

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## ERRATA

On page 408 of the October, 1921, issue of the journal, the "note" immediately under Fig. 1 in the article by Dr. Cary on "Sterility Studies—Simplified Methods in Diagnosis" should be deleted.

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Issue of October, 1921, page 433: The name of Dr. W. J. Butler was inadvertently included as co-author with Dr. Reuben Peterson of the paper on Pneumoperitoneum and Roentgenography as Aids to More Accurate Obstetric and Gynecologic Diagnosis. Dr. Reuben Peterson of Ann Arbor, Mich., was the sole author of the paper.